Pit and Quarry

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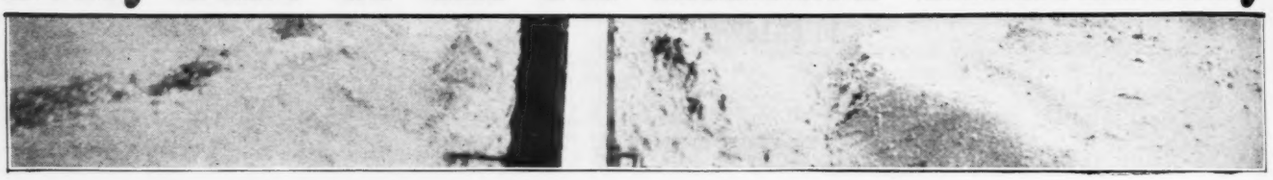
Every Part of the Pit Reached Economically



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Pit and Quarry

Vol. XVIII CHICAGO, ILL., MAY 22, 1929 No. 4

MEN OF THE INDUSTRY

The portrait printed on this page in each number of PIT AND QUARRY is taken from our files and its selection is without significance as to current events or as to the position of the individual in the industry.

Henry Crown

Mr. Crown is President of Material Service Corporation
Chicago, Illinois

New Florida Quarry will Produce Travertine

A Rock Utilized by the Ancient Romans

This Deposit, Worked Years Ago, Is Being Reopened To Produce Beautiful, Buff-Colored, Durable, Ornamental and Building Stone

"IN A land where orange groves, vegetable farms and tourists are the sources of a new found wealth, any substantial thing like a geological deposit becomes a matter of great moment," says a writer in the *New York Times*, referring to the recently discovered travertine deposit on the West Coast of Florida.

Because of the quality of this stone, named Floridene, in honor of the state and the extent of the deposit, it seems likely that it may prove a matter of great moment to the building industry throughout the country.

Use of this stone dates back to about twenty years prior to the Civil War, when a sugar mill was constructed on property adjoining that where the quarry is now located. This sugar mill was burned down during the war. Both the walls and chimney were constructed of large blocks of this travertine stone, it being considered merely a good, suitable hard building stone. The ruins of this mill are in existence today and close comparative examination of these ruins with stones recently quarried, discloses the fact that it has withstood the semi-tropical rains and brilliant sunshine for over eighty years with apparently no loss of color or erosive effects.

The next known use of this stone was in the city of Bradenton about twenty-eight years ago, when a large three-story building was constructed of it. Careful inspection of this building shows no erosion, nor is there any evidence of fading of the beautiful warmth of color.

From the time of the erection of this building until a little more than three years ago this source of supply was lost sight of. Then, quite by chance, it was re-discovered on what is now known as the Floridene properties. Due to an embargo on building materials, an effort was made to locate nearby a suitable concrete aggregate. In this search a small outcropping of the Floridene deposit was found and samples of the stone were taken to mineralogists for analysis. This analysis proved that the find was a natural travertine. The result was the organization of the Florida Travertine Corporation.

The property of the corporation consists of a bed of eighty acres of this stone in Manatee County near Bradenton. A modern electrically-driven cut-

Section of Wall in Sugar Mill Built at Bradenton, Florida of Travertine About 1845

Showing Hydraulic Removal of Overburden from Floridene at Bradenton, Florida

ting and finishing plant, with a capacity of three million square feet of stone annually, has just been completed and two miles of railway have been built connecting the Seaboard Air Line Railway with the plant.

Through a contract recently closed, the Johns-Manville Corporation has secured the exclusive sales and distribution of this stone for a long term of years.

Floridene stone is found in free ledge formation, unfaulted, there having been no geological disturbances in this area. It is a sedimentary dolomitic stone formed in the mid-miocene period. During this formation carbonates of lime and magnesia were carried down in solution by fresh waters and settled in practical purity, in the eighty-acre basin which forms the property of the Florida Travertine Corporation. The stone contains approxi-

Car of Stone Being Loaded at Floridene Quarry for Shipment to New Jersey

Plant Building, Showing Blocks of Floridene

mately 6 per cent extraneous matter, including iron oxide which forms the basis of its buff color. It is almost entirely free from silica and contains a fractional amount only of alumina.

Floridene stone has a low water absorption (4.07 per cent by weight) and an unusually high natural cementing value (52 per cent). Compression strength, as determined at the testing laboratories of Columbia University, shows more than 9,000 lbs. per square inch. Weathering tests, as required by the New York Building Code, calling for 20 alternate freezing and thawing tests, conducted also at Columbia University, show no deterioration but an increased compression capacity averaging over 12,000 pounds per square inch.

Floridene stone blends appropriately with marble and kindred interior finishes and can be carved into mouldings, cornices, and other ornaments. It can also be polished to any desired effect. Many architects who have examined it pronounce it much more interesting in texture and color than either the imported travertine or French limestone and they see in it a material having a wider range of adaptability.

Due to the fact that the Floridene deposit is unfaulted, a simple quarry operation is possible and the product can be offered structurally sound and without lamination, in blocks limited in size only by facilities to handle. In the quarry, it is soft enough to be sawed easily, but it hardens on exposure. Various engineers have estimated the quantity of available stone at well over eighty million cubic feet. The stone is whitish or light cream in color, with wavy lines of former lamination.

Clinton A. Sheldon is chairman of the board of directors of the Florida Travertine Corporation; W. L. Smith is president, and George L. Jones, vice-president. Robert W. Gieger is quarry and plant superintendent.

In announcing this new product, Lewis B. Brown, president of the Johns-Manville Corporation, says: "Because of our company's familiarity with the building trade and intimate contact with architects throughout the country, we believe that we can be of unusual service in supplying what is sure to be a large demand for this new American product. Such effort on Johns-Manville's part is in line with the company's established policy of steadily increasing the lines of products with which the Johns-Manville Corporation can render a real service to industry throughout the world."

Cement Plant to Be Erected In Damascus, Syria

A group composed of 22 business men and notables of Damascus have recently commenced a survey of the possibilities presented by the region of Damascus for the local manufacture and sale of artificial portland cement, according to a report from Vice Consul D. F. McGonigal, Beirut, Syria. The group intends to form a stock company capitalized at $440,000, and although its members expect to subscribe to most of the shares, they are willing to sell a one-quarter interest to an American company manufacturing cement or cement-making machinery. Prices, c. i. f. Beirut, are desired from American manufacturers of cement-making machinery for the equipment necessary to install a plant with an output of about 200 tons daily and also the charge for sending an expert to supervise the installation of the machinery. The equipment is expected to cost about $115,000.

From *Commerce Reports.*

El Salvador Reduces Duty

Consul General S. L. Wilkinson, in *Commerce Reports,* advises that, by a Salvadoran Executive decree dated March 8, the import duty on marble and alabaster in slabs or blocks, polished or unpolished, has been reduced from $15.30 to $2.50, United States currency, per 100 kilos.

Suggestions for Maximum Degree of Safety in Wire Rope Operation

By I. L. STONE*

SAFETY, life and strength of wire rope are governed by five factors. These are: external wear, internal wear, fatigue due to bending and overstressing, lack of lubrication, and occasionally kinking. Each of these factors is controllable by either improved operating methods or better selection of rope types, and constructions.

Any effort to reduce external wear on rope is lost if *first* all sheaves are not inspected for alignment, size and condition. Sheaves with oversized bores, broken flanges, or worn treads, greatly accelerate wear on wire rope, encourage the jumping of sheaves—the latter being as dangerous to workmen as any other element, save actual breakage. Accurate sheave alignment, smooth sheave treads, correct groove sizes, and proper lubrication will do much to reduce external wear of wire rope, lengthen the rope's life and service, and reduce accident hazards.

Few general recommendations can be made on the matter of sheaves, since so much depends upon existing, individual conditions. Whether a hard or soft sheave is employed is a matter that must be determined by the individual operator. Generally speaking, hard metal treads in sheaves are a means for prolonging wire rope life. Whether or not it is more economical to replace the sheave than the line is also determinable only by individual conditions. According to the U. S. Bureau of Mines, however, a rope should be replaced when the diameter of the outside wires has been reduced by wear to sixty-five per cent of its original sectional area,—or when as many as six broken wires appear in any one lay of 6x19 rope.

Internal Wear

Wire rope life and service are affected very materially by internal wear. According to D. F. McCurchy of the Industrial Commission of Ohio: "Being flexible, there is considerable internal motion in the wire rope itself as it changes direction under load, as when passing over sheaves."

* Supervising Field Engineer (Western District) Globe Indemnity Company.

Showing One Common Function of Wire Rope in Industry

It must be apparent to every one that where friction is set up there is a tendency to wear the rope from within—to break down the internal wires—an action that can be corrected only by thorough lubrication.

Said Mr. McCurchy before the Construction Section of the Seventeenth Annual Safety Congress: "Where the rope is subjected to reverse bends, as in the case of the load line on a derrick passing from the hoist engine under a sheave at the bottom of the mast and over a sheave a short distance up the mast, this stretching shifts from one side of the rope to the other, increasing the internal motion and consequently the internal wear. It follows that the smaller the sheave, the greater the stretch in the outside wires.

"Internal wear can be materially reduced by proper lubrication and the use of larger sheaves. The latter is not always possible, being limited by the design of the equipment; but larger sheaves will pay their added cost in increased rope life wherever conditions permit their use.

"The value of lubrication cannot be stressed too strongly and the additional cost of lubricating them is negligible when compared with the increased life resulting. Proper lubrication will minimize the breaking of interior wires which weaken the rope and which cannot be detected by casual inspection."

Kinking

Perhaps one of the most important factors in the destruction of wire rope and in the creation of wire-rope hazards is kinking. Kinking is an inherent characteristic of wire rope that is made in accordance with the old or ordinary methods. Elimination of this destructive tendency is possible by either the selection of the pre-formed rope or through the employment of greater care in handling. In taking wire rope from a reel or drum it is best either to roll the reel along the ground or to mount the reel on an axis and run the rope off as needed. Employing the same method when taking rope from a coil will permit the rope to lie flat, thus preventing kinks. Never unreel or uncoil wire rope as you might a hemp rope.

Because of the internal stress that is inherent in the wires and strands of ordinary wire rope there is a marked tendency of the rope to be "cranky." Repeated field service, however, has shown preformed wire rope to be remarkably free from this dangerous "crankiness."

Projecting Wires Most Dangerous

Not long ago a letter came to my attention from the Keller Foundry Company in Knoxville, Tennessee. In this letter Mr. Keller commented at some length regarding the accident hazard attendant upon the kinking and the breaking of wires in ordinary wire rope. He said:

"In sling and hoist service ordinary wire rope kinks badly. Still worse, just the moment the rope is worn a bit the broken wires stick out and jag the workmen's hands. Workmen handling ordinary wire rope, particularly in this section, do so only with fear. Pre-forming a wire rope, however, eliminates the internal torsional stresses of the individual wires and strands, and this elimination permits any broken wires to remain in place and to lie flat, thereby eliminating the jaggers which tear workmen's hands and frequently cause blood-poisoning.

"In skidding logs down our Tennessee mountains it is the custom of the workmen to pull a ⅜-in. line to the top of the mountain to be logged. This small line is here run through a snatch-block and pulled back down the mountain to the steam skidder, where it is fastened to the skidder drum. The skidding line (much larger in diameter) is then pulled up and down the mountain on this first small-diameter rope.

"Unless one has seen the operation one has no idea of the amount of work involved in pulling this small line to place. Ordinarily worn-out cable is used for this purpose, and in handling it the workmen suffer considerable injury to their hands because of the projecting broken wires. Frequently, these injuries develop into serious sores and lay men up for several days. I once saw a pair of hands that had kept its owner idle for weeks.

"All injuries to employees are paid for either directly by the employer or indirectly by the insurance company. This, of course, means loss to the operating company. Of far greater concern, however, is the injury to workmen. I have had the broken wires of ordinary wire rope jag my hands, and I know only too well that the rust, dirty oil and the acid with which the core of the rope is impregnated during fabrication causes very painful sores and in many cases serious blood-poisoning. More and more our logging firms are learning the wisdom of employing pre-formed wire rope for this type of service."

While a great deal depends upon the crane or shovel operator it frequently happens that wire rope will snarl itself when a clam-shell overturns or a load slips. Such occurrences frequently produce kinks and sometimes destructive snags. No end of pains and extreme care is necessary in unsnarling wire rope. Let me emphasize here that wire rope which once has been snarled or badly kinked should never be replaced in service without close inspection and perhaps tests for strength. In fact, a kinked rope is always a dangerous rope.

Types of Connections

My experience with wire rope operators in almost every field has forced home the realization that there still are many erroneous beliefs regarding wire rope connections and attachments. This

in spite of the very plain instructions issued by every reliable wire rope manufacturer.

Clip connections will develop efficiencies of better than 80 per cent when they are properly applied. This type of connection, however, is improperly applied a surprisingly large number of times. Too many riggers seem to prefer to stagger the clips, then pull the U-bolts up so tight as to crush the rope—with a resulting destructive action that greatly reduces the safe operation of wire rope. The proper use of clips involves placing all U-bolts on the same side of the rope (the short end), and none of them pulled so tight as to crush the wires. These clamps should be retightened after the load is applied, then inspected regularly because such a connection is probably no more than seventy-five per cent efficient.

Socketing wire rope is another type of attachment entirely dependent upon the varying human element for its efficiency percentage. This because so much importance attaches to the method of cleaning the wires, the thoroughness with which the job is done, the degree of heat for the molten babbitt or zinc, how well the wire rope has been broomed to wedge into the basket, and finally how efficiently the molten metal has penetrated into every crevice of the broomed or wedged rope end.

The pre-formed type of rope spoken of above lends itself exceptionally well to the attachment of fittings or clips because it requires no seizing when cut and because of its ease in handling. Indeed, in passenger elevator ropes the pre-formed type has made possible a small cylindrical type of fitting which is processed to the rope by means of hydraulic pressure sufficient to cold flow the steel into all the interstices of the wires and the strands.

Wire rope is perhaps not so hazardous as other pieces of equipment. However, accidents in which wire rope is a factor are not limited to those caused by the failure of the line itself. There are too many cases where wire rope has been either a contributing factor or the actual cause of a very costly accident. Projecting wires are an all-too-common source of lacerated hands, while improperly applied clips, attachments or fittings too often permit the failure of a wire rope at its point of connection. In spite of the fact that wire rope does not contribute as heavily to our accident records as other types of equipment, accidents of this kind are of sufficient frequency and severity to warrant the constant attention of every wire rope operator. Guarding sheaves with barriers, keeping the wire rope properly lubricated, insisting upon the employment of the proper sheaves, a more careful selection of wire rope construction and types, and the more painstaking application of attachments will do much toward the elimination of accidents due to wire rope operation.

President Reimer Announces Road Builders Next Meeting

The 27th annual convention and road show of the American Road Builders' Association will be held at Atlantic City January 11 to 18, 1930.

This announcement has been made by Frederic A. Reimer, consulting engineer of East Orange, New Jersey, the incoming president, succeeding R. Keith Compton, director of Public Works, Richmond, Virginia, who remains a director. James H. MacDonald, New Haven, Connecticut, continues his years of service as treasurer, while Charles M. Upham, Washington, District of Columbia, continues as secretary-director. The additional directors are J. S. Helm, Standard Oil Company, New York, and Arthur W. Dean, chairman, State Highway Commission, Boston, Massachusetts.

"The Board of Directors are of the opinion that it is advisable to hold the convention and exposition in different parts of the country from year to year," Secretary Upham explains. "We had that policy in mind when we left Chicago two years ago, after meeting for five years there, and took the 1926 show to Cleveland. That year's convention was so successful as to cause our return there last year, but a further change of location this year is deemed suited to the best interests of our entire association."

Twenty Pan-American countries and ten nations of the Old World were represented in the 30,000 attendance last January at the Cleveland convention and show.

Texas claims a deposit of marble that rivals in quality the finest Italian stone. The deposit lies in Marble Mountain, twenty-eight miles southwest of Alpine, and it is said will yield stone of every desired color.

A bed of onyx which has been disclosed to have a width of 300 feet and a length of 1,500 feet has been disclosed recently in the Black Hills of South Dakota. This is claimed as the most massive known deposit of this beautiful marble in our country.

"Best Publication in Our Line"

PIT AND QUARRY,
Chicago, Illinois.
Gentlemen:

We wish to say that we think PIT AND QUARRY is the very best publication in our line and that the trade is fortunate to have the means of communication and assistance that your magazine gives. It is a real service and we would not be without it. We find that it gives us reliable and interesting news of the trade and all of our personnel read it.

Yours very truly,
MORRIS LIMESTONE PRODUCTS CO.
(Signed) Paul M. Schroter.

Lone Star Cement Plant at Birmingham, Alabama, Converted from Dry to Wet Process

Alterations Make Plant One of Most Modern in South

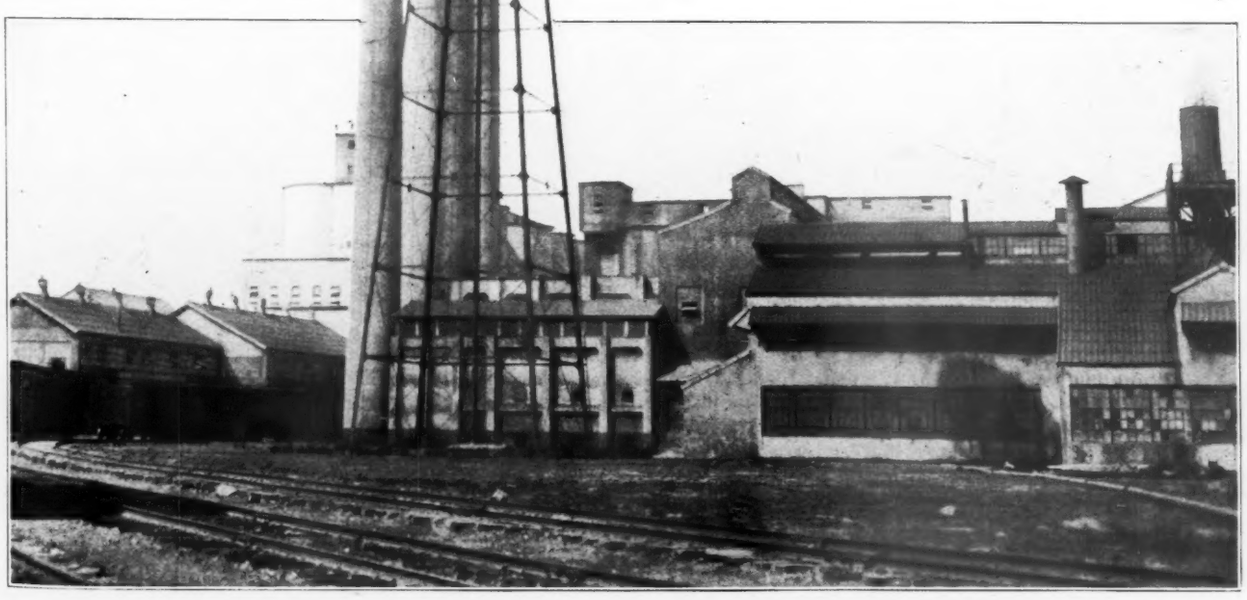
THE Birmingham, Alabama, plant of the International Cement Corporation is one of the largest operated by that company and is also one of the largest and most modern plants in the South. It is of additional interest because of the fact that it was built originally as a dry process plant and has since been converted to use the wet process. This change was made under the supervision of the company's engineering force.

The plant first went into operation about July 1, 1923, and was taken over July 1, 1925, by the present owners as a subsidiary, the name being changed to Alabama Portland Cement Company. On January 1, 1929, all of the domestic plants of the International Cement Company changed their names to conform with the brand of cement manufactured, this plant assuming the name of Lone Star Cement Company, Alabama Plant No. 1. The plant is located on an 80-acre property about five miles north of downtown Birmingham.

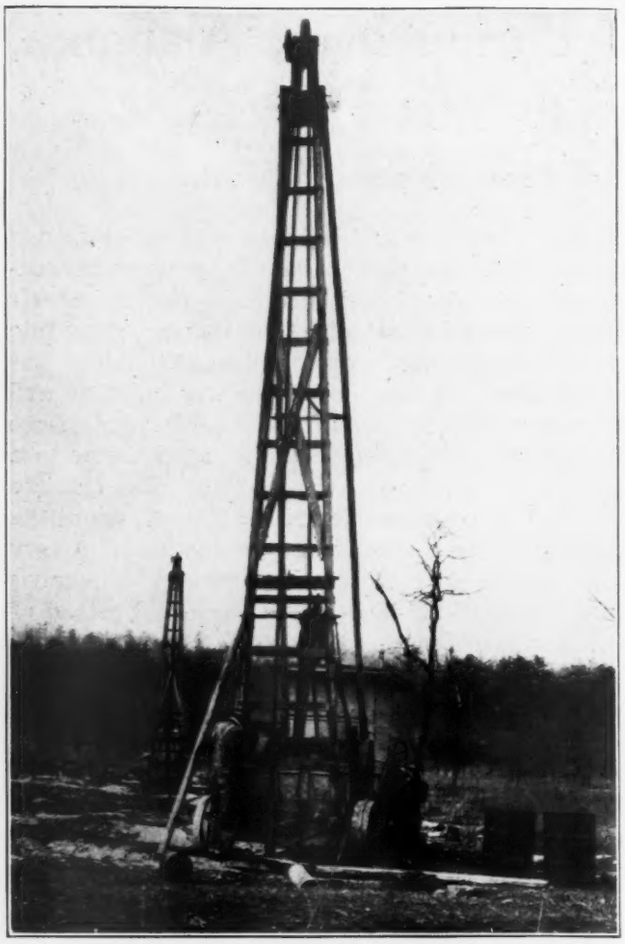
Plant Alterations

When the plant was altered from the dry to the wet process numerous changes were made. These are briefly described. The kiln building was extended and all of the four kilns lengthened. The mill building was extended and an additional tube mill installed. The coal mill building was extended and altered and the former stone dryer room converted into the blacksmith and electric repair shops. The old blacksmith shop was converted into a power house and the open storage building was roofed over. A new packhouse was built, as well as a reservoir for water supply 600 yards from the quarry. The three small kiln stacks were torn down and larger new ones erected. The changes effected a considerable reduction of operating costs and made possible the production of a very high grade of cement. The cement company's forces erected all of the steel work and set all of the new machinery. Other work which was done by several different firms is also described herein.

The five slurry storage tanks were built by an engineering firm that specializes in such structures, in 1923 when the plant was first constructed. They were originally used as raw material storage tanks and had walls 5 inches thick. When the plant was converted to the wet process a 7-inch concrete lining was added and the tanks used for slurry storage. This later work was done by the same engineering company which also built the 130-foot addition to the kiln building. The original kiln stacks comprised one which was 176 feet high and three smaller ones. When the plant was rebuilt the three small chimneys originally erected were torn down and three more 176-foot stacks erected. The three new stacks were built by a company which specializes in stack construction.



Lone Star Plant from East. Coal Building in Right Foreground, Cement Packhouses at Left



One of Well Drills in Operation

Stone Quarrying and Crushing

The stone quarry is north of and immediately adjacent to the plant. The deposit is highly stratified and has a dip to the southeast of about 30 deg. It is very uniform in calcium-carbonate content, with an average of over 92 per cent. There is very little overburden.

Two Cyclone electric well drills with 5⅞-inch bits are used for drilling. Forty-per cent and 60-per cent dynamite is used for bank shots and is detonated from a switch on the well drills. Two 30-ton electric shovels load the stone into 7-ton capacity steel side-dump cars, which are hauled to the foot of the incline to the plant by two 8-ton battery locomotives and an 8-ton steam locomotive.

In line with the neatness and cleanliness characteristic of all International Cement Corporation plants, the quarry floor is kept very smooth at all times. This is done by secondary blasting and some filling with loose stone. Moving of quarry tracks is thus made much easier. The quarry drains into a sump in one corner, from which the water is pumped to a reservoir by an 8-in. centrifugal pump. The pump house is of concrete and is built into the quarry face.

The cars are drawn, one at a time, up the single track incline to the crusher house by a single-drum hoist driven through an enclosed-gear drive by a 225-hp. electric motor. The stone is dumped into a 30-in. gyratory crusher, which is belt driven by a 150-hp. motor. The crusher discharges into a bucket elevator which lifts the stone to a 36-inch hammermill. This discharges through a chute to a concrete pit in the raw material storage building adjoining the crusher house. An overhead crane operating a 3-cu. yd. bucket takes the stone from this pit and distributes it over the storage.

The Shale Quarry

The shale quarry is at Lewisburg, Alabama. The shale is excavated by a 30-ton electric shovel and is loaded into one-cu. yd. steel quarry cars. These are hauled by a 5-ton gasoline locomotive to the

Shovel Loading Stone in Quarry. Electric Locomotive at Right

primary crusher, which is a 15-in. gyratory. A crushing roll further reduces the shale and discharges onto a 24-in. inclined belt conveyor to a 100-ton capacity storage bin. Here the shale is loaded into railroad bottom-dump cars and shipped to the plant, where it is stored in the same building as the stone but in a separate concrete walled compartment.

Slurry Mixing

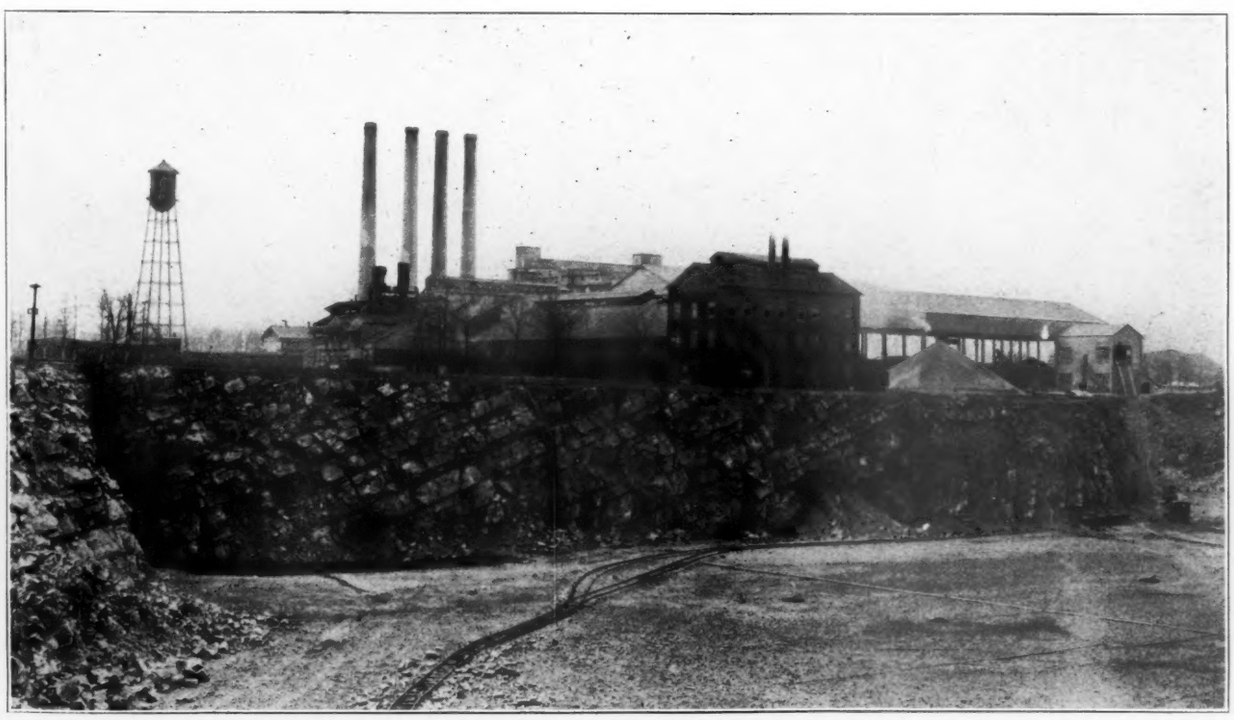
Stone and shale are delivered by the overhead crane from storage to two poidometers, one for stone and one for shale. These discharge into a pan conveyor which feeds to three Hercules mills for preliminary raw grinding. The mixture is elevated by two bucket elevators to a slurry feed trough over the tube mills. This feeds by gravity the three 7-ft. by 26-ft. raw tube mills. A 12-in. screw conveyor carries the slurry from the mills to a sump, from which it is fed to the five concrete slurry storage tanks by two pumps. These tanks have a capacity of 1,000 barrels each.

The storage tanks feed by gravity to two mixing basins under the kiln house floor, where the slurry is agitated by four mechanical agitators, two for each basin, each pair being driven by a 15-hp. motor through a speed reducer. Each basin has also two air-lift agitators. A bucket elevator at each of the two basins handles the slurry to a feed trough with a screw conveyor agitator. Four ferris-wheel feeders take the slurry from the trough and discharge into four kiln feed pipes, each feeding one of the kilns.

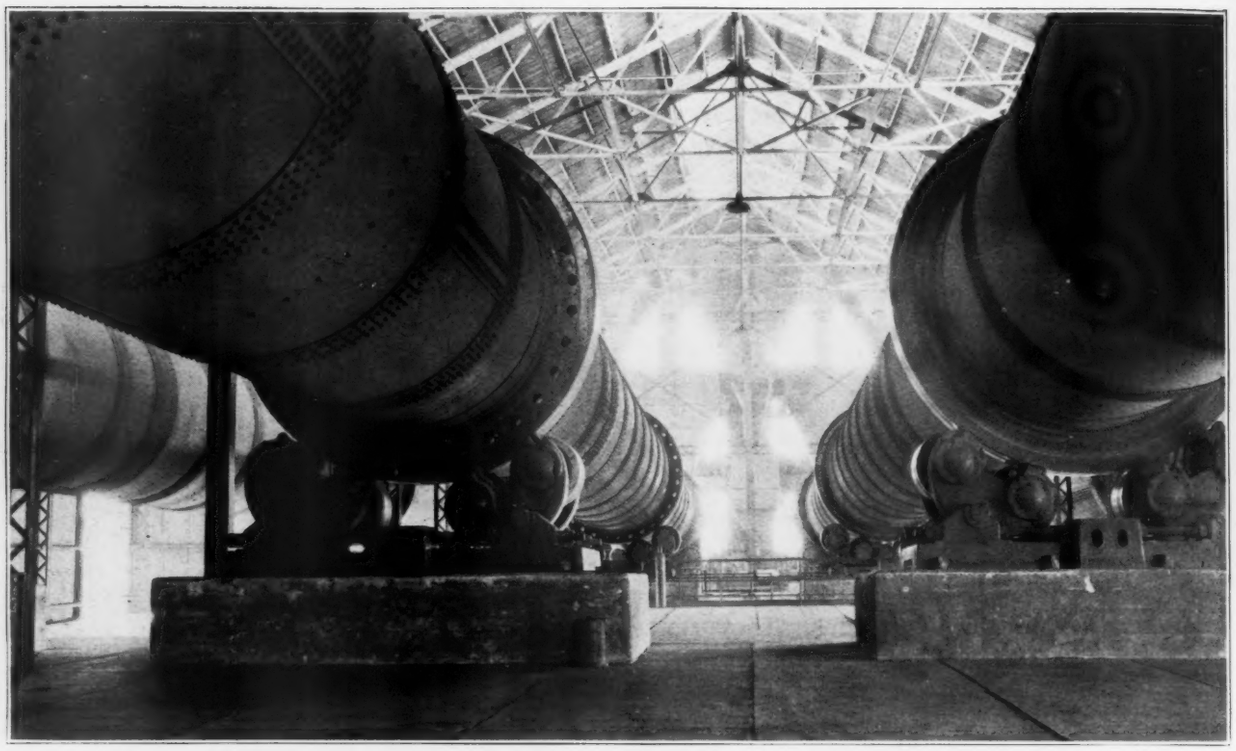
Kiln and Cooler Operations

The four kilns were originally 10 ft. in diameter by 150 ft. long but, when the plant was altered from the dry to the wet process, 130 feet were added onto the firing end of each kiln, giving a total of 280 feet. Each kiln is driven through an enclosed gear drive by a 100-hp. motor. The clinker discharges through the kiln hoods into four 9-ft. by 80-ft. coolers, each of which is driven by a 20-hp. motor. These were all installed when the plant was converted, the clinker having previously

Carload of Stone Being Hauled Up Incline to Crusher House



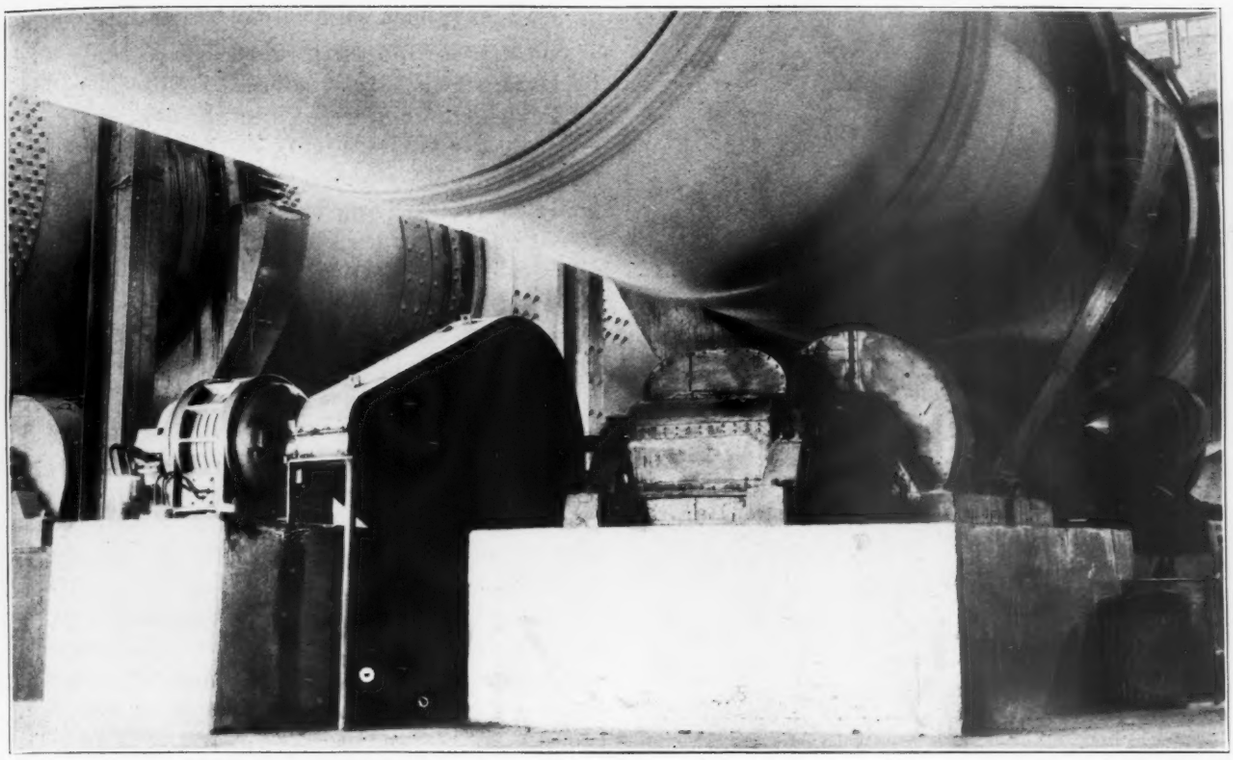
View from North End of Quarry. Incline to Crusher Building at Right, Sump at Left. Note Inclination of Strata and Smoothness of Quarry Floor



View Down Center of Kiln Room from Feed End, Cooler Pit Visible in Middle Background

been cooled in outdoor storage piles. The coolers discharge onto a skipulter which feeds an inclined bucket elevator discharging into the clinker storage section of the raw material storage building. During the late winter and early spring an additional outdoor clinker storage pile has been built between the storage building and the edge of the quarry. This is handled by a crane traveling on

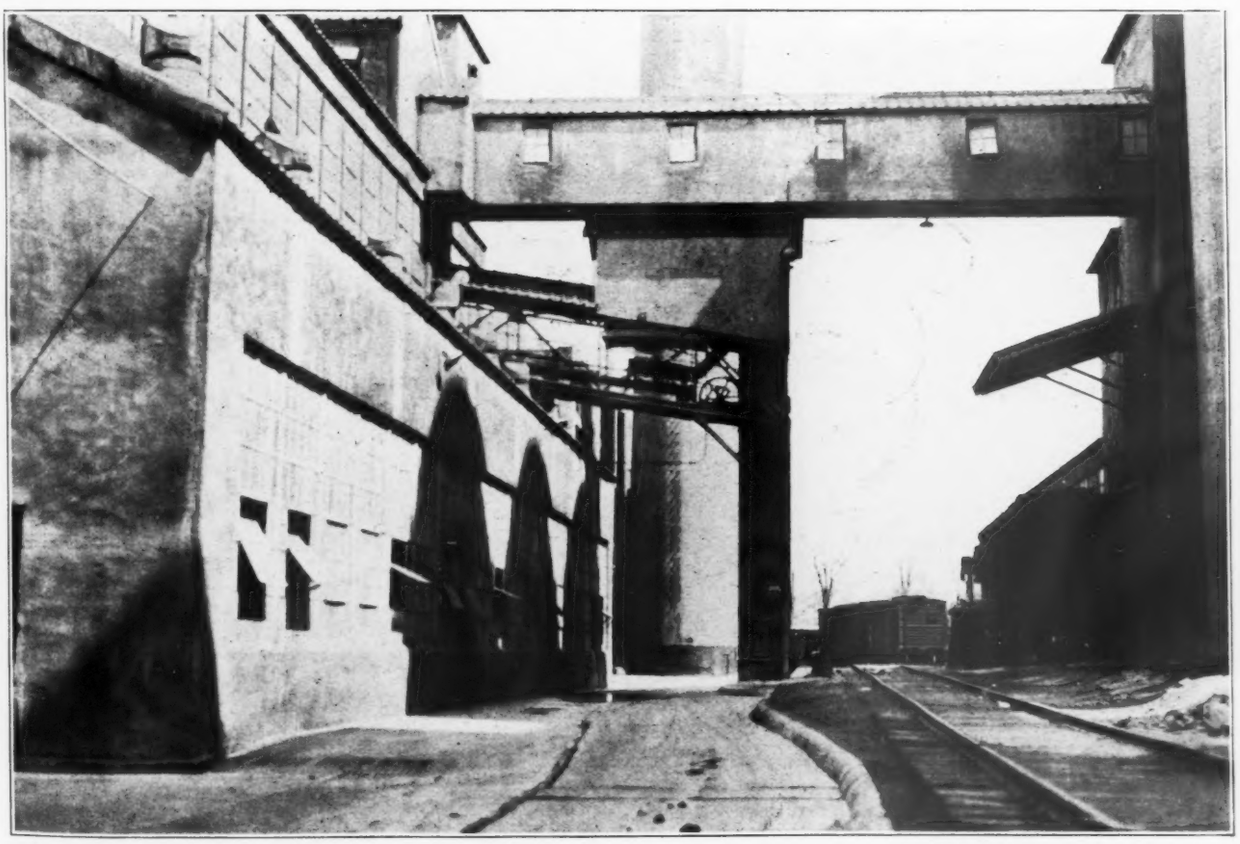
View Inside Storage Building Showing Overhead Crane Handling Stone from Crusher Discharge Pit to Storage. Second Crane in Background Handles Gypsum and Clinker



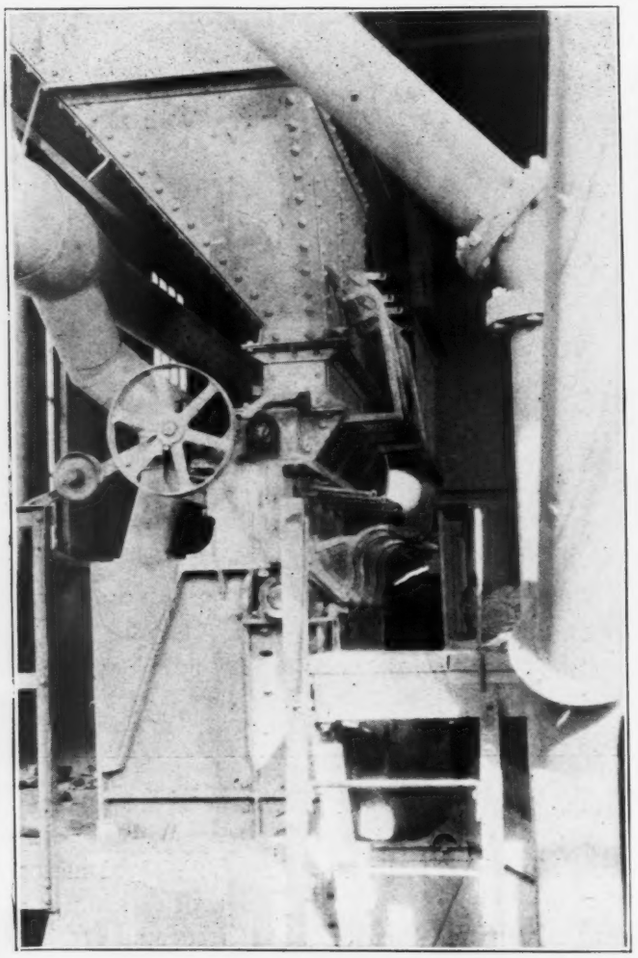
Drive Mechanism of One of Kilns. Refuse Bucket at Right Is Symbolic of the Efforts Made in Lone Star Plants for Neatness and Cleanliness

rails and handling a 3-yd. bucket.

A second overhead crane, operating a 3-cu. yd. bucket, loads the clinker from storage into a concrete bin which feeds an automatic Weightometer. This discharges onto a pan conveyor feeding to a bucket elevator where gypsum is added.



Elevator in Which Gypsum Is Unloaded, in Center. Enclosed Conveyor from Mill Building (Left) to Pack House (Right) Shown Above



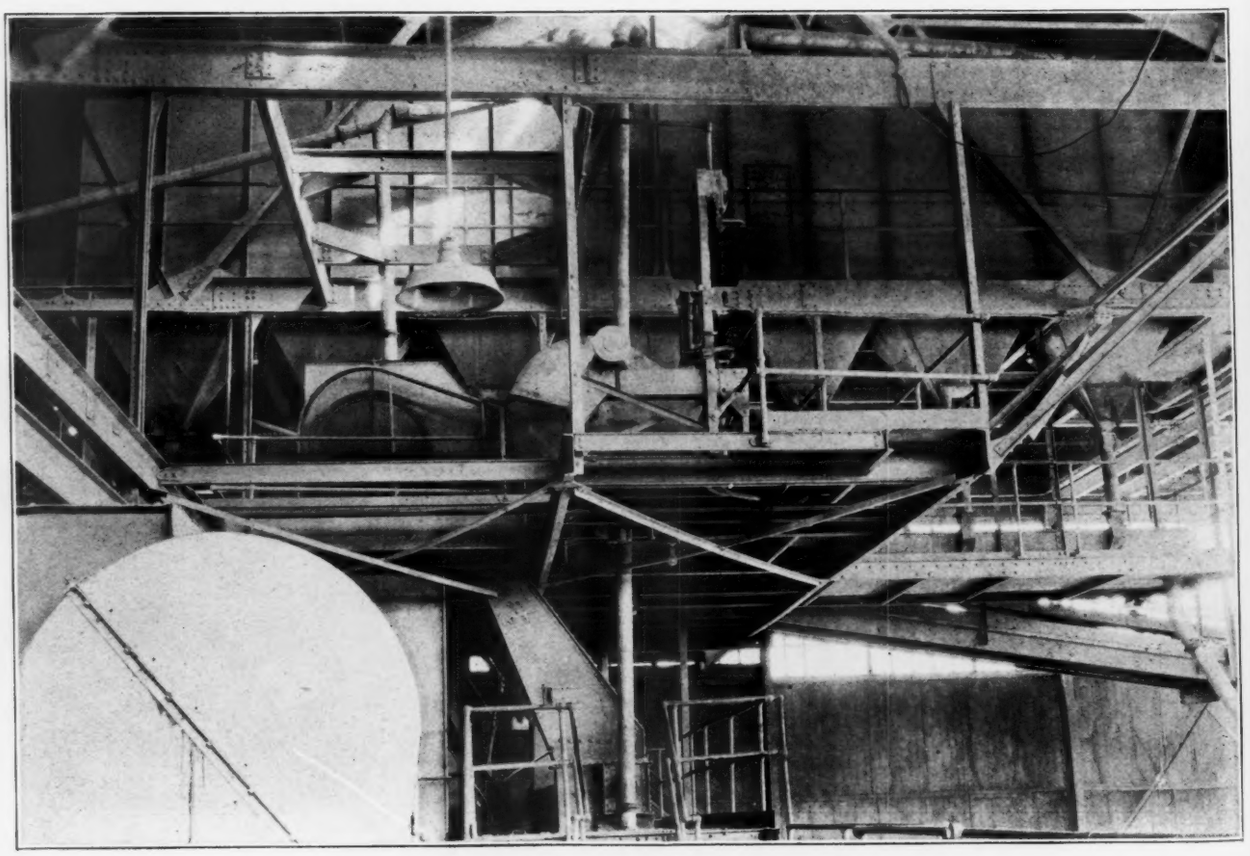
One of the Four-Tube Packers

Gypsum and Clinker Grinding

Gypsum is shipped in by box-car and unloaded by hand into a bucket elevator feeding a belt conveyor which discharges into the 30-car capacity concrete gypsum storage silo. The silo discharges at its base onto a pan conveyor which is automatically controlled from the clinker scales. The pan conveyor discharges onto a belt conveyor which feeds to the same elevator that handles the proportional clinker. This elevator feeds onto a drag-chain conveyor which discharges into the Hercules mill bins in the mill building. The Hercules mills discharge into a bucket elevator which delivers the material to the tube-mill bins. The two finish tube mills are each 7-ft. by 26-ft. Each discharges by screw conveyors to a bucket elevator and by a series of screw conveyors into the cement storage silos or to the packhouse as desired. The elevator is driven by the same motor which drives the screw conveyor to the first six silos. Another conveyor connecting onto this one delivers the cement to any of the last six silos and is driven through a worm-gear reducer. Both of these screw conveyors are reversible to allow redistribution of the cement.

Cement Storage

The twelve cement storage silos consist of two separate units of six silos each. They have a combined capacity of 180,000 barrels of cement, including the two interstices formed by each group, these being also used for storage. The six silos



The Dust Collecting System in the Mill Building

nearest the packhouse were built when the plant was erected in 1923, by the same engineering company that erected the slurry storage tanks. The other six silos were built in 1925.

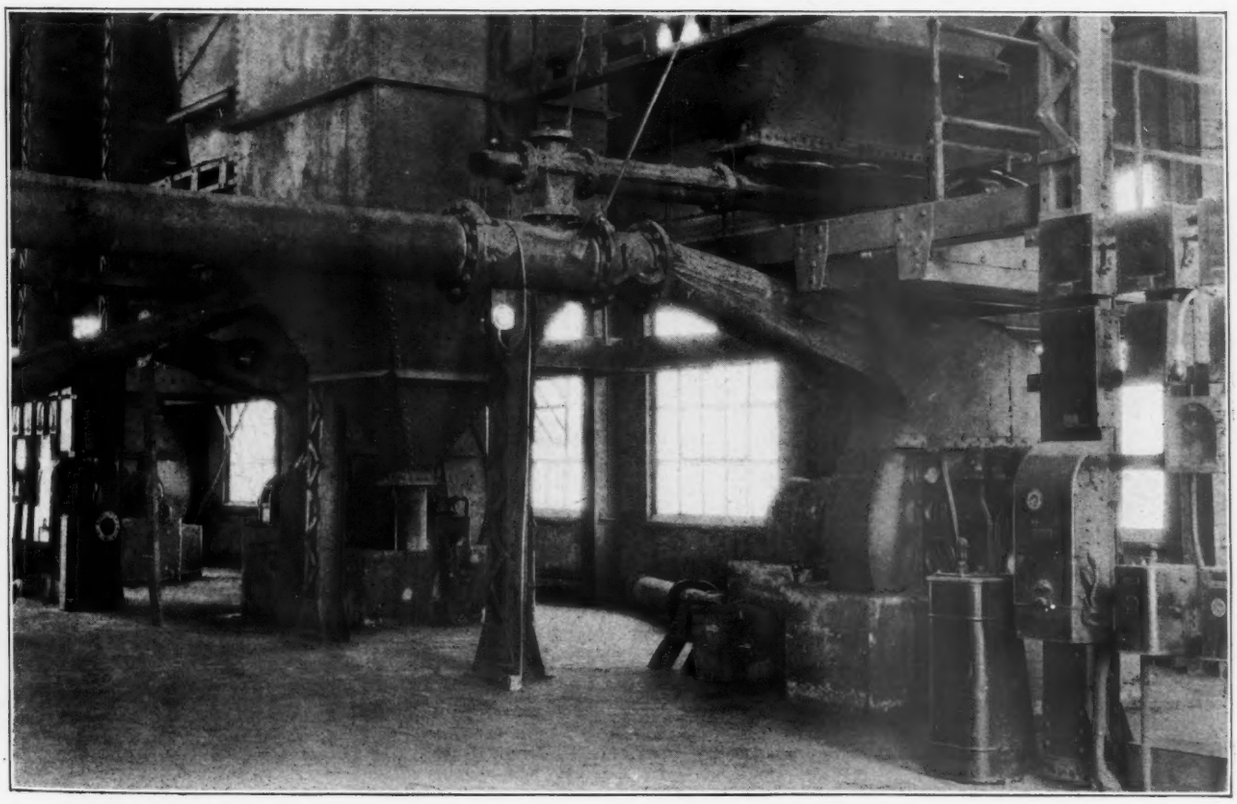
Cement is drawn from these silos by two screw conveyors, each serving six silos and two interstices. Each of these screw conveyors is driven through a worm-gear reducer. They feed, by two bucket elevators, into a conveyor to the paper bins in the original packhouse. By means of another bucket elevator between the two groups of silos, the cement from any silo can be transferred to any other silo through the reversible screw conveyors on top.

Cement Pack Houses

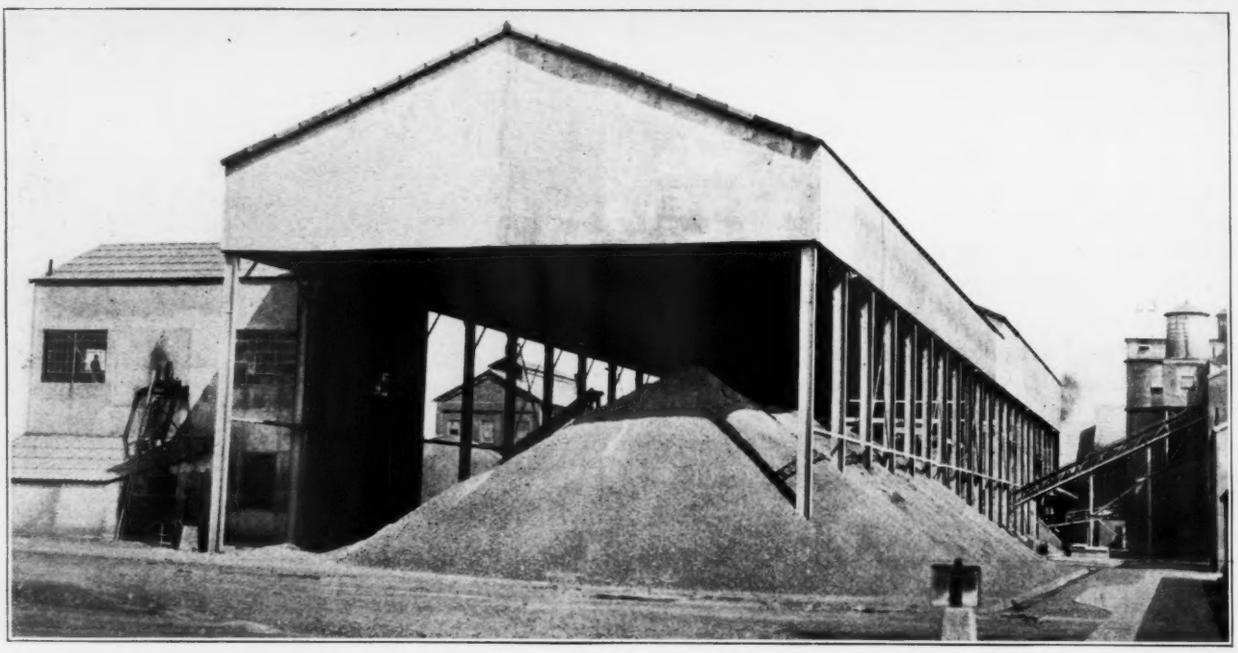
The original packhouse, which was built when the plant first went into operation, contains four 4-tube packers. Two belt conveyors carry the bags to both sides of the building, where they are loaded directly into cars. A 200-lb. capacity springless scale at the end of each conveyor is used to check on the weights of the bags. A large electric fan on a platform opposite the end of each conveyor ventilates the cars being loaded and blows the dust back into the packhouse. A 7-vent dust-collecting system is used.

The new packhouse is separated from the original packhouse by two loading tracks. It is similar to the first except that it contains two 4-tube baggers and that the dust-collecting system has a size 45 Sirocco fan driven by a 10-hp. motor. A 16-inch screw conveyor carries the cement from the other

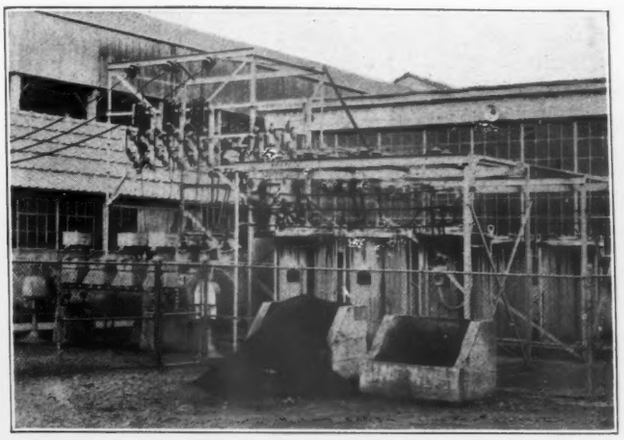
Drive End of One of Coolers. One of Kilns Visible Above

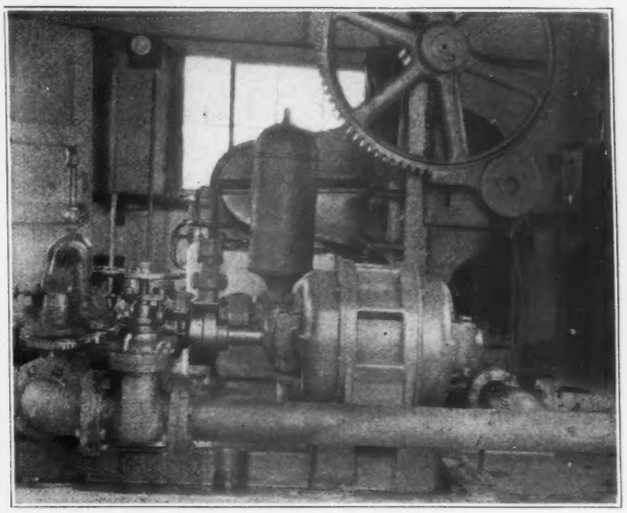


The Coal Feeding Mechanism in the Kiln Building

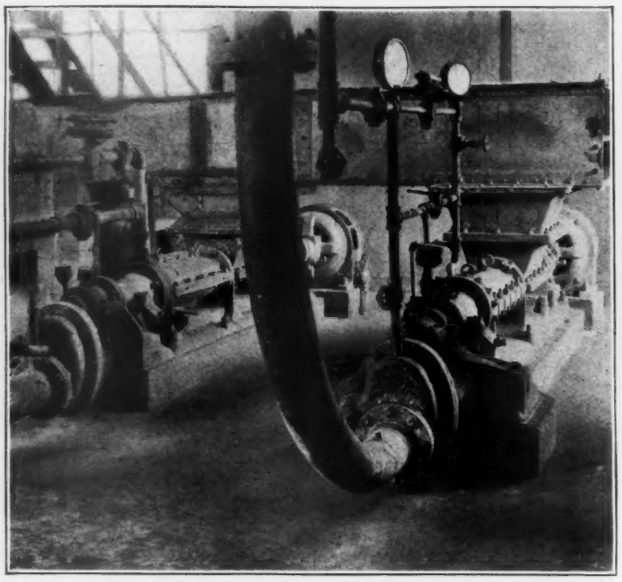


Above—View of Plant from West. Storage Building at Left, Cement Silos at Right. Center—Storage Building With Crusher House at Left and Conveyors to Mill Building at Right. Below—Cement Silos from Southwest. New Pack-House Visible at Right

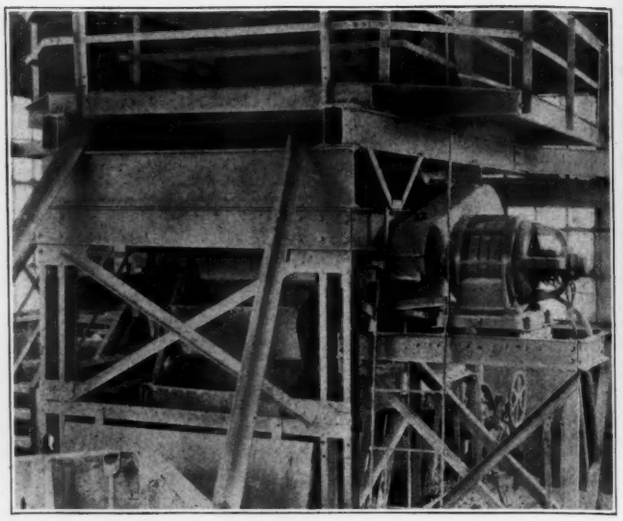




Upper Left—Sump and Pump-House in Quarry. Upper Right—Outdoor Sub-station with Machine Shop in Background. Center—Interior of Pump-House, Centrifugal Pump in Foreground. Below—Coal Grinding Mills in Coal Building



Pumps Which Convey Pulverized Coal from Mills to Kiln Building



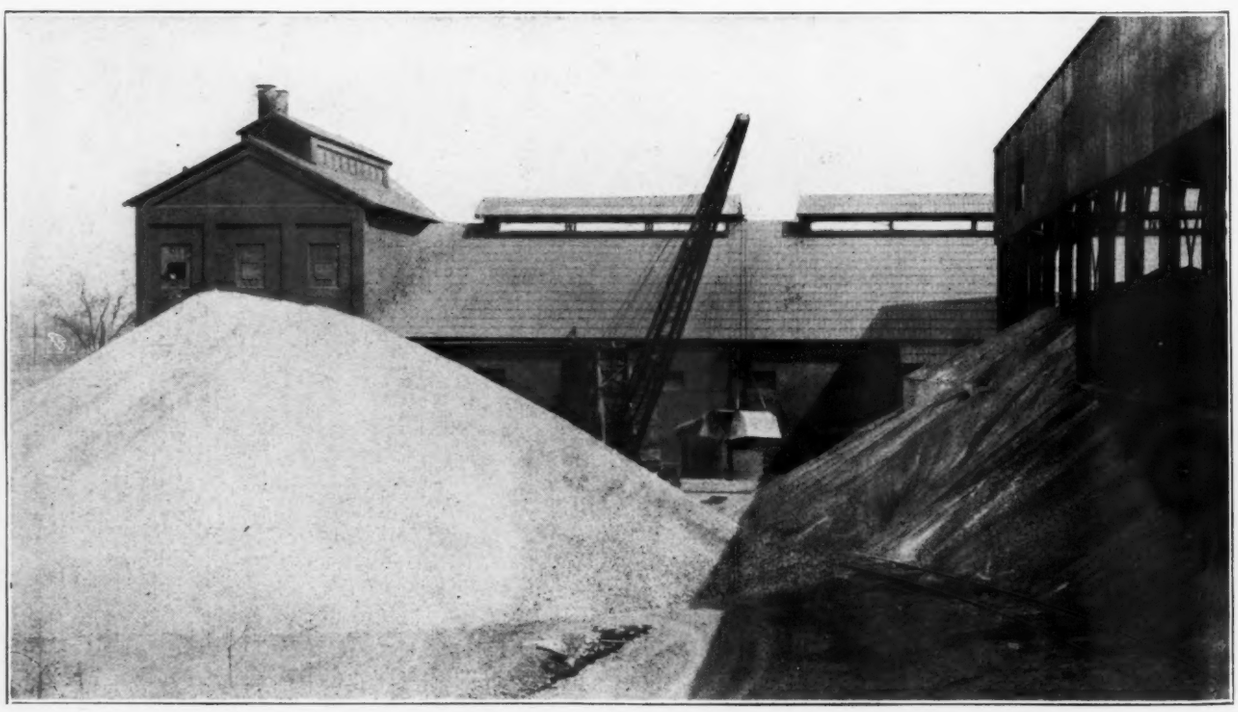
Elevator Which Feeds Stone from Primary to Hammermill Crusher

packhouse, discharging into a second 16-inch screw conveyor which feeds the packer bins. Both of these are driven from the same 25-hp. motor through a speed reducer. In each packhouse the dust-collecting system discharges into a bucket elevator which feeds back into the conveyor to the packer bins. Both elevator and conveyor are driven from the same motor through speed reducers.

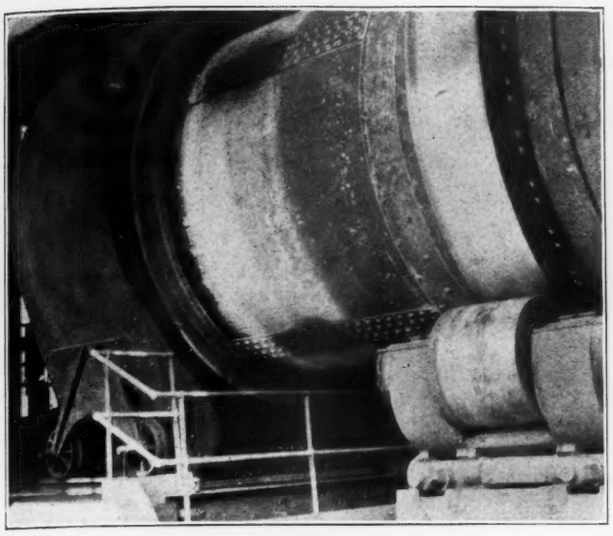
Coal Handling

Coal is received from mines in the vicinity of Lewisburg and discharged from bottom-dump cars into a track hopper next to the coal house. A pan conveyor discharges the coal onto an inclined chain elevator which feeds two rotary dryers. One of these discharges directly and the other by a short screw conveyor into a bucket elevator. The elevator feeds another screw conveyor, which distributes the coal to five mill feed bins over the five 42-inch coal mills. Each of the mills is driven through a flexible coupling by a 75-hp. motor. An additional bin and foundation is in place for a possible future mill.

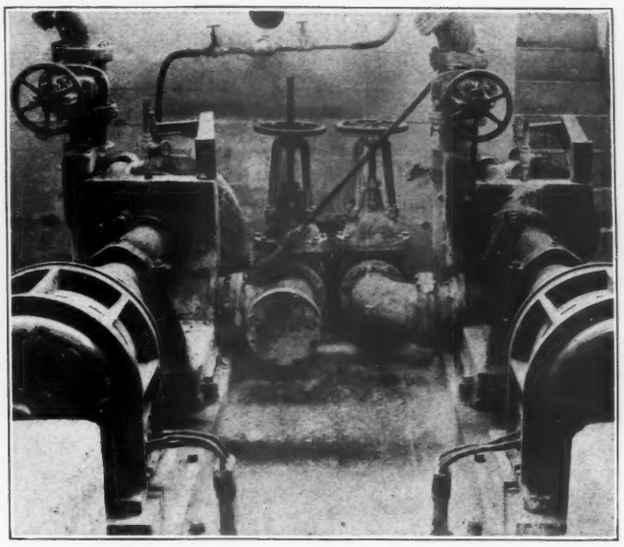
The powdered coal discharges from the mills into a screw conveyor to two 5-inch pumps, which convey the coal to four large steel storage bins in the kiln building, one for each kiln. Each bin discharges through a small 4-inch screw conveyor to the kiln feed-pipe, where a blast of air from a Sirocco fan blows the coal into the kiln firing cham-



Crane Handling Clinker to Outdoor Storage Pile. Kiln Building in Background



Firing End of One of Kilns



Centrifugal Pumps in Pit Under Tube Mills

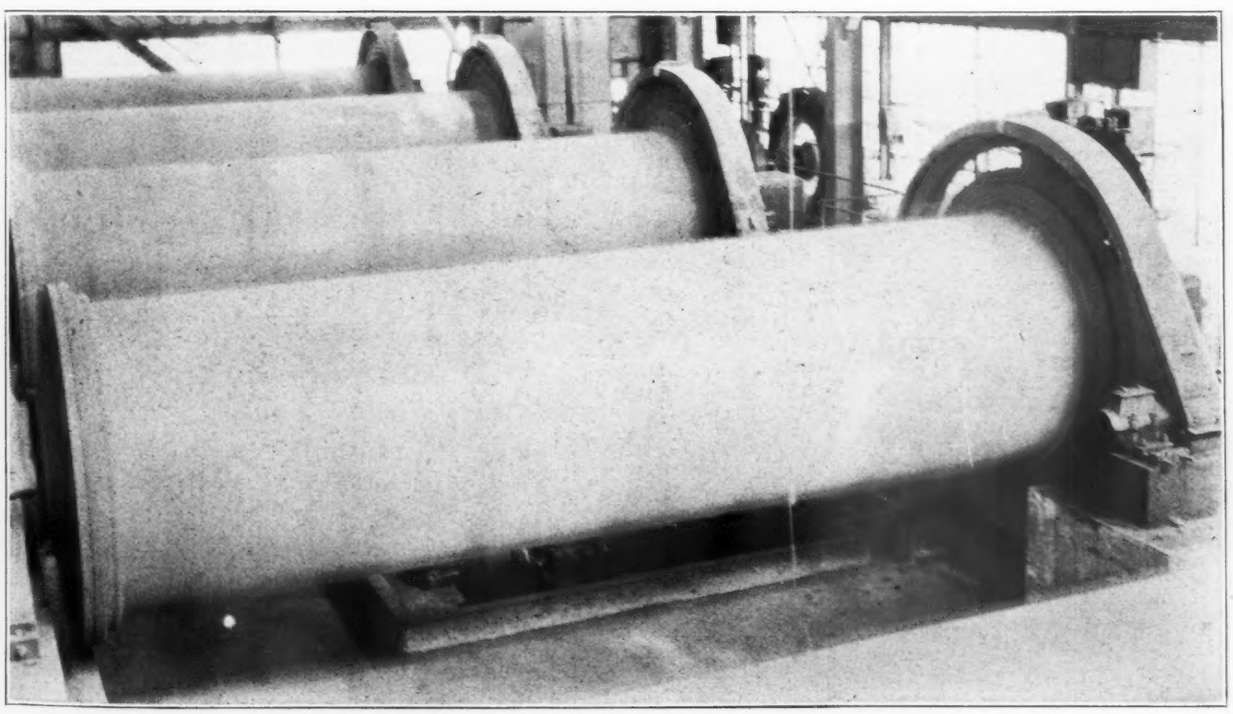
ber. Each of the four fans is driven by a direct-connected 25-hp. motor.

Power and Water

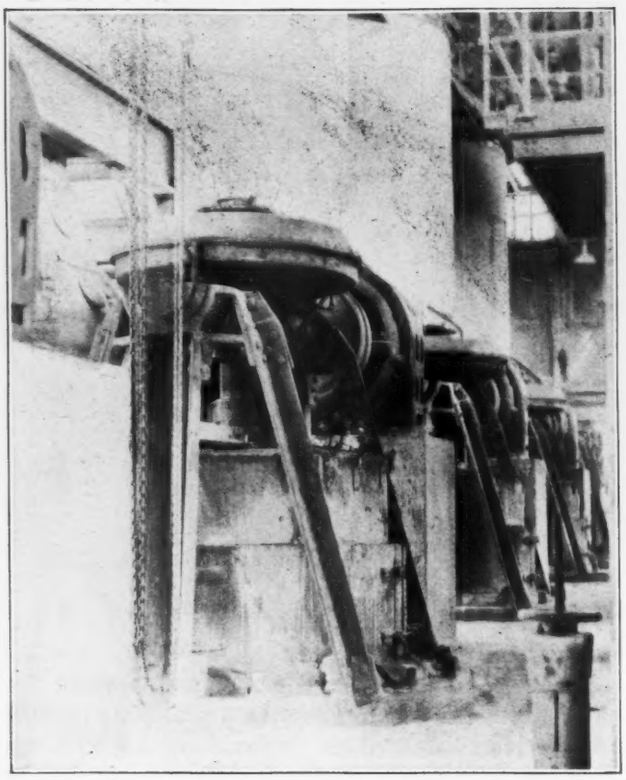
Electric power comes into the plant at 6,600 volts, from a near-by by-product plant where it is generated, to an outdoor sub-station, where it is reduced to 2,300 volts. Further reduction takes place in the power house, which is in the same building with the tool house. Six 100-kva. transformers here reduce the current to 206 volts and two synchronous converters, operating at 1,200 rpm., transform to 250-volt direct current for general plant operations. Separate transformers in various parts of the plant furnish 440-volt current where required. A 17-panel switchboard in the power-house controls the various plant departments.

The power house also contains a 17-in. by 12-in. air compressor, belt-driven by a 100-hp. electric motor. This furnishes air at low pressure for slurry agitation. Two 12-in. by 12-in. compressors, each driven by a 75-hp. motor, and an Imperial Type 10 double compressor with one 15-in. by 12-in. cylinder and one 9¼-in. by 12-in. cylinder, driven by a 100-hp. synchronous motor, furnish air for general use such as air drilling in the quarry and air hammers in the blacksmith shop.

Water for plant operations is stored in a reservoir on the property with a capacity of 6,000,000 gallons. Most of this is pumped out of a sump which drains the quarry. A neat steel and stucco pump building at the reservoir houses the pumping equipment, which consists of a 3-in. single-stage



View in Mill Building Showing Four of the Five Tube Mills

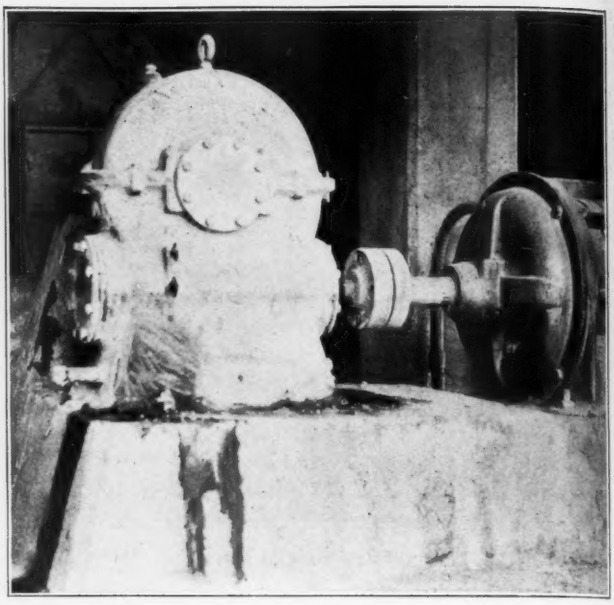


Pulverizers in Mill Building. Feed Bins in Background

centrifugal pump and a 5-in. Triplex pump which is used in an emergency. These pump water from the reservoir to a 20,000-gallon steel water tank at the plant. An automatic control shuts off the pumps when the tank at the plant is full.

Office and Laboratories

The building which houses the plant offices and the physical and chemical laboratories is an attrac-



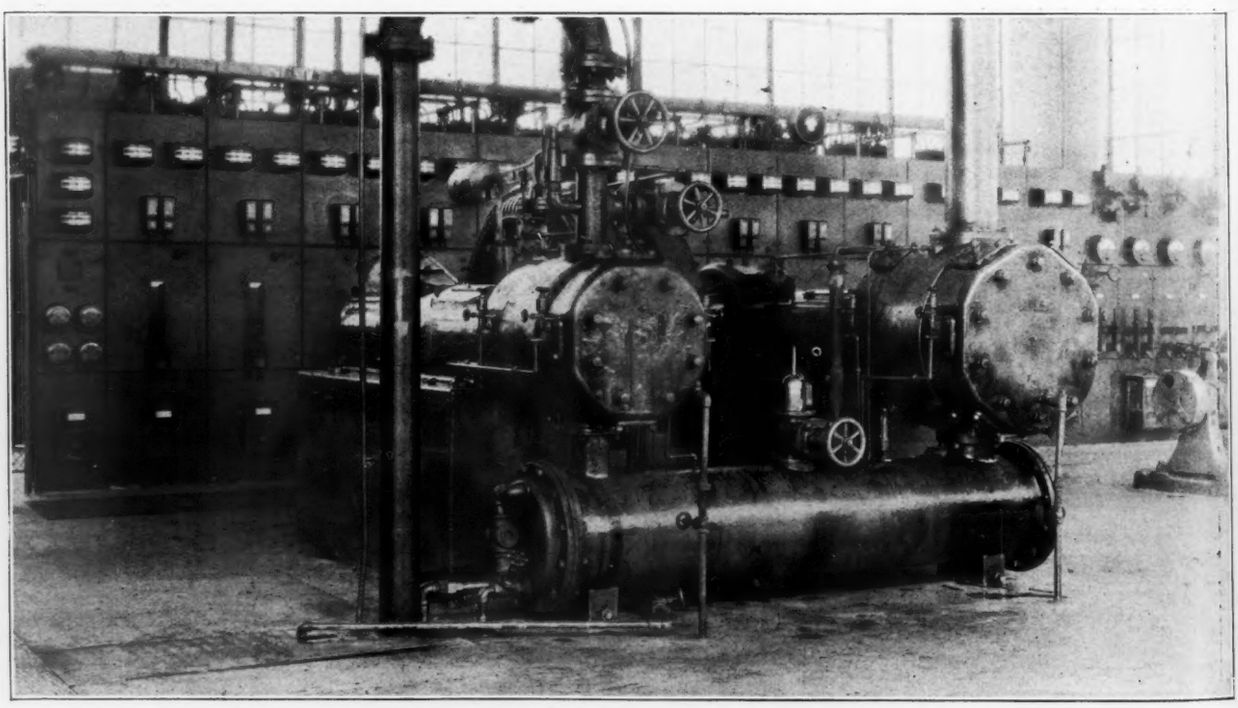
Speed Reducer Drive of One of Screw Conveyors Under Cement Silos

tive Spanish-type bungalow with a stuccoed exterior. It is surrounded by a well-kept lawn and shrubbery. In front of the building is the flagpole rising from the center of a concrete star which is found at all of the International Cement Corporation's plants.

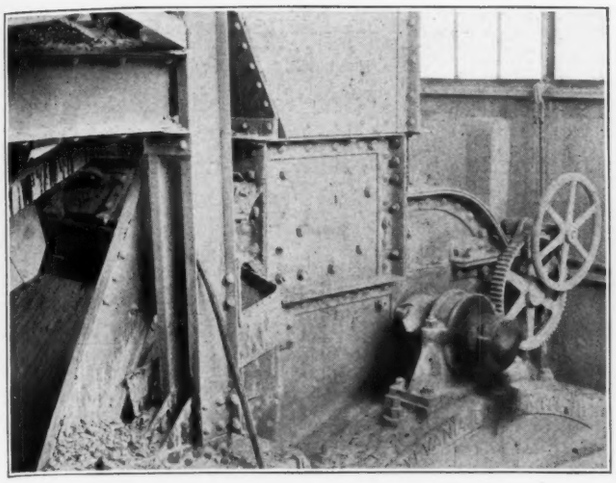
Another building adjacent to the office contains a drafting room and another physical testing laboratory. This laboratory is completely equipped, containing, among other equipment, a 200,000-lb. compression testing machine and a tensile testing machine.

Miscellaneous

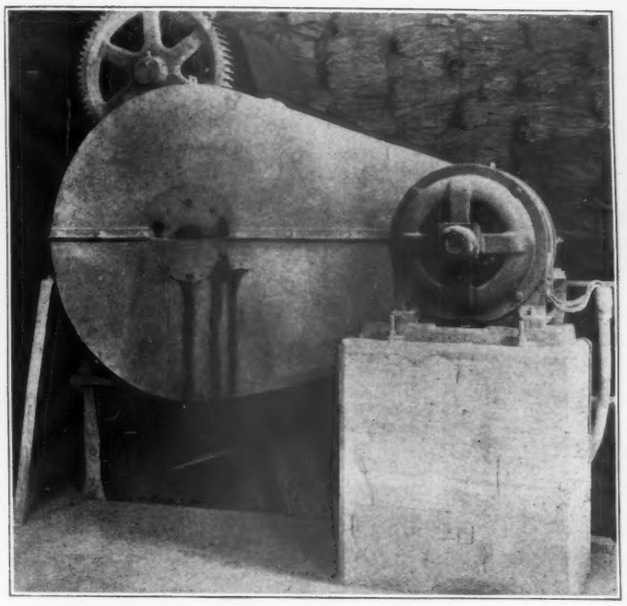
The grounds, as is true of all International Ce-



Interior of Power House Showing Air Compressor and Switchboard



Hammermill in Stone Crusher Building



Elevator to Sack Storage in Packhouse

ment Corporation plants, are kept scrupulously neat and clean. Wherever possible the ground is seeded with grass and flower gardens are artistically distributed about the property. A corps of gardeners is maintained to keep these in the best condition. The plant also is unusually clean, the piles of cement dust and the customary litter of greasy waste and tools being conspicuously absent. All roads about the plant are of concrete and the entire property is fenced with woven-wire fencing on concrete posts.

A number of horseshoe courts are maintained where the employes can engage in friendly competition during noon hours. The company has both indoor and outdoor baseball teams made up of employes, both teams playing under the name of Lone Star. The indoor baseball team last winter won the city league championship from 23 other teams. The outdoor baseball team won the championship in its division and placed third in the city championship. Wm. Cabaniss, superintendent of the plant, is vice-president of the city league, and H. M. Zimmerman, chief chemist of the plant, is manager of the baseball teams as well as one of the pitchers.

A part of the expenses incurred by these teams is paid by the profits from a lunch room on the property, where lunches are served at nominal prices. The space is donated by the company, which also defrays the expenses of the teams which the profits from the lunch room will not cover. The company also donates the time of the men who operate the lunch room. The loyalty of the employes to the company, regardless of their status, is another characteristic of International plants. This loyalty is reflected by the low rate of labor turnover at the plant.

The Office Building of the Lone Star Plant

Officers

H. Struckmann is president of the International Cement Corporation. A. D. Stancliff is general superintendent in charge of the plant here, the plant at Spocari, Alabama, which was recently taken over from the Warrior Cement Company, and the Lone Star Cement Company plant at New Orleans, Louisiana, which was formerly called the Louisiana Portland Cement Company. J. W. Johnston is vice-president and manager of the Birmingham plant. Wm. Cabaniss is plant superintendent and H. M. Zimmerman is chief chemist.

Salt, Bromine, and Calcium Chloride In 1928

The salt manufactured and sold in the United States in 1928 amounted to 8,074,700 short tons, valued at $26,772,568, according to reports of the producers to the United States Bureau of Mines, Department of Commerce. These figures, compiled in cooperation with the Geological Surveys of Kansas, Michigan, New York, Oklahoma, Texas, and Virginia, show an increase of 7 per cent in quantity and 8 per cent in value over the sales for 1927, which were 7,568,690 short tons, valued at $24,817,962.

Evaporated salt, which represented 30 per cent of the total sales in 1928, amounted to 2,430,050 tons, valued at $17,822,503, an increase of 7 per cent in both quantity and value. Rock salt, which represented about 28 per cent of the salt produced in 1928, amounted to 2,217,780 short tons, valued at $6,923,877, an increase of 3 per cent in quantity and 8.5 per cent in value.

The salt content of brine produced by chemical companies and used by them for the manufacture of different chemicals amounted to 3,426,870 short tons in 1928. This was 42 per cent of the total salt production and represented an increase of 8 per cent in quantity over 1927.

The figures of evaporated salt and rock salt include 180,650 tons of pressed blocks made by the salt manufacturers and valued at $1,499,420; 145,720 tons of the blocks, valued at $1,205,794, were made from evaporated salt and 34,930 tons, valued at $293,626, were made from rock salt.

Michigan, New York, Ohio, Kansas, Louisiana, and California, in the order named, are the largest producers of salt. Michigan produces the most evaporated salt, and New York the most rock salt. New York, Louisiana, Kansas, and Michigan produce 99 per cent of the rock salt.

In 1928 the bromine recovered by the producers from natural brine and bromine content of bitterns used by producers in the manufacture of bromine compounds was 2,164,000 pounds, valued at $649,475, an increase of 23 per cent in quantity and 15 per cent in value.

Symposium on Mineral Aggregates By A. S. T. M.

THE American Society for Testing Materials announces as a portion of the program of the annual meeting to be held at Atlantic City, June 25-28, a "Symposium on Mineral Aggregates," which should be of considerable interest to all producers and users of aggregates.

Highway engineers will be particularly interested in papers dealing with "Methods of Inspection," by A. S. Rea, Chief, Bureau of Tests, Ohio State Highway Department; "Fine Aggregates in Concrete," by H. F. Gonnerman, of the Portland Cement Association; "Fine Aggregates in Bituminous Mixtures," by H. W. Skidmore, Chicago Paving Laboratory; "Influence of Coarse Aggregates Upon the Strength of Concrete," by F. C. Lang, Engineer of Tests and Inspections, Minnesota State Highway Department; "Influence of Coarse Aggregates Upon the Durability of Concrete," by F. R. McMillan, of the Portland Cement Association; "Effect of Aggregates Upon the Stability of Bituminous Mixtures," by Prevost Hubbard, of the Asphalt Association, and "Aggregates in Low Cost Road Types," by C. N. Conner, of the American Road Builders' Association.

The Symposium will be opened by a paper on "Organization Problems," by R. W. Crum, Director of the Highway Research Board, and Chairman of the Committee in Charge of the Program, and will close with a paper on "Needed Research in Aggregates," by F. H. Jackson, of the Bureau of Public Roads.

In addition to the above, there will be papers dealing with the "Use of Aggregates for Sanitary Filters and Railroad Ballast," by Dr. H. F. Kriege, of the France Stone Company; "Influence of Quality of Aggregates on Fire Resistance of Concrete," by Dr. S. H. Ingberg, of the Bureau of Standards; "Fine Aggregates in Mortar and Plaster," by J. C. Pearson, of the Lehigh Portland Cement Company, as well as a paper by R. B. Young, of the Ontario Hydro-Electric Commission, on "Determination of the Concrete Making Value of Fine Aggregates from Water-Cement Ratio Tests."

Portland Cement Association Holds Spring Meeting

As we go to press the Portland Cement Association is completing the three-day sessions of its spring business meeting in New York City. The meeting opened May 20 in the Biltmore Hotel and will cover the usual routine incident to an annual meeting of the members of this association.

Blue Bell Lime Company Has Up-to-date Equipment

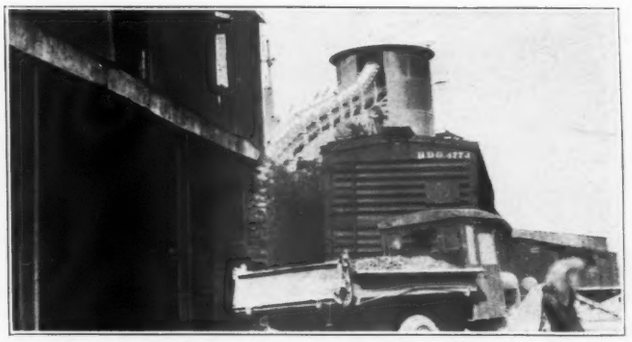
By F. A. WESTBROOK

THE plant of the Blue Bell Lime Company at Flourtown, Pennsylvania, is located about one mile from the Philadelphia city limits. It is therefore most advantageously situated with respect to its market so that a large proportion of its output may be delivered by truck direct to the consumers. As is the case with all the producers in this region, the burned lime is shipped exclusively in bulk and the hydrated lime in paper bags. The close proximity of these plants to their market certainly gives them an enormous advantage over similar producers for the New York market.

Several different operations are carried on. First there is the production of asphalt filler, which is perhaps the most interesting on account of the newness of the machinery; second, the production of burned lime; third, the production of hydrated lime; and fourth, the crushed-stone end of the business.

Crushing Plant

The machinery for crushing stone for road work was installed by Johnson & Hoehler of Fernwood, Pennsylvania. The quarry cars filled with spalls are dumped, part way up the incline to the kilns, into a hopper above a Gates gyratory crusher. This crusher is on the ground level and the stone which passes through it is elevated to the revolving screen on top of the stone bins by means of a Good Roads Machinery Company elevator with 24-in. by 24-in. buckets. The screen is of the same make and separates the stone into the usual commercial sizes between grit and 2½-inch. These drop into bins provided with spouts for loading trucks as shown in one of the illustrations.



Burned Lime Conveyor to Lump Lime Storage Tank

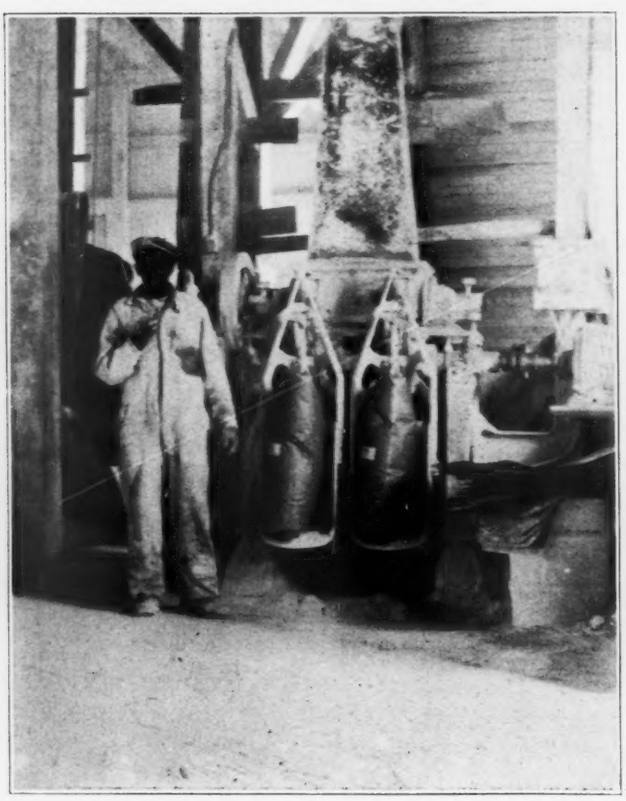
Tailings from the screen drop into a bin having a spout which is so located that it can be used to load quarry cars along the incline to the tops of the kilns. The tailings are then hauled up and dumped into one of the kilns now operated only as a dryer in the production of the asphalt filler used extensively in Philadelphia.

Pulverizing Plant

For making the asphalt sand the "close-stage" grinding and pulverizing process is used. This machinery also was installed by Johnson and Hoehler. Dried stone is drawn from the bottom of the drying kiln onto a Webster belt conveyor which discharges into the Jeffrey hammer mill.

General View, Showing from Front to Back: Crushing Plant, Coal Elevator, Kilns, Pulverizing Plant, and Hydrating Plant

Ring-roll Mill and Elevator to Separator



Valve-Bag Packer for Hydrated Lime

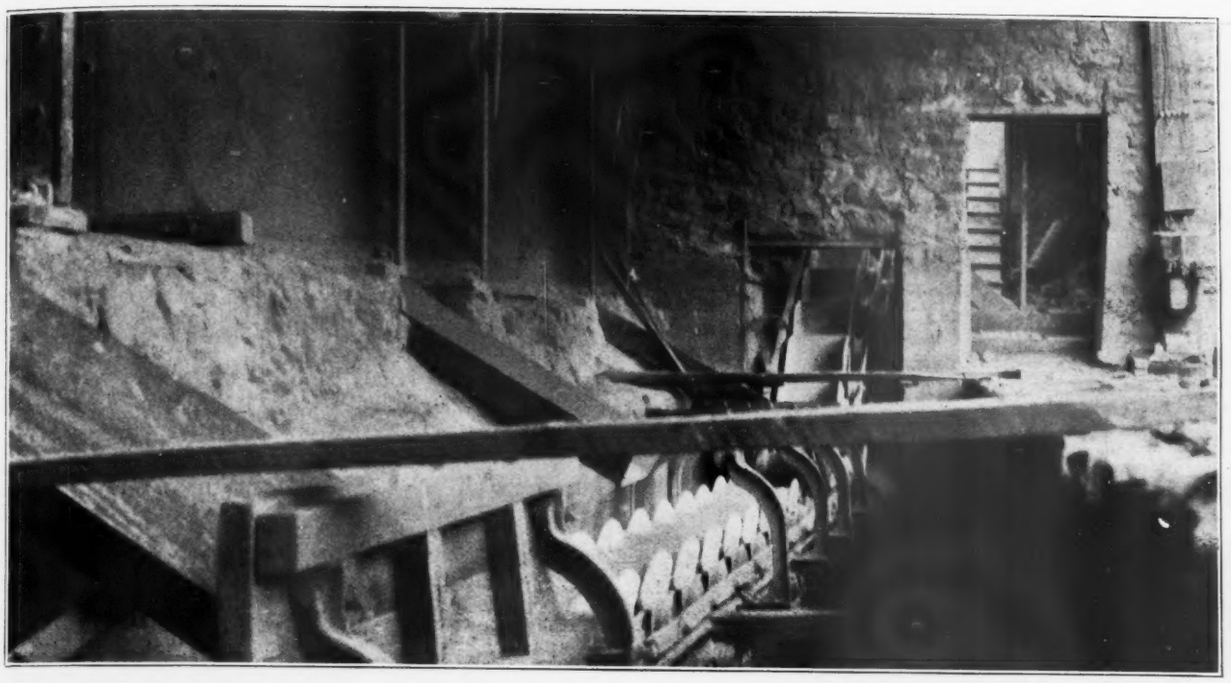
From this the ground stone is taken by a Link-Belt screw conveyor to an elevator of similar make which discharges into a 14-ft. Gayco separator. The fines from this are taken by a second Link-Belt elevator to the wooden storage bins shown in the illustrations, while the coarse material drops into a Kent ring-roll mill. The latter discharges into the first elevator which delivers the reground material to the separator. The storage bin, it will be seen, is so arranged that trucks may be driven underneath for loading.

Burning Plant

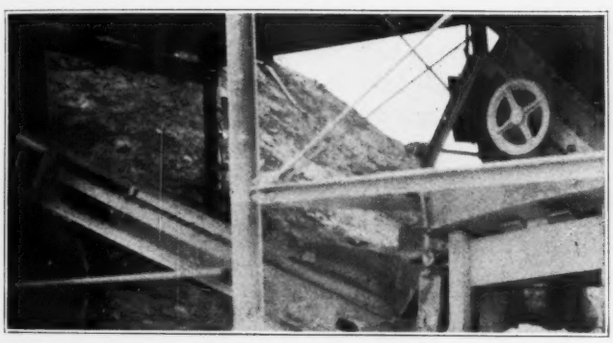
Originally there were five lime kilns but, as already stated, one of them is now used as a dryer. Stone is hauled up the incline from the quarry to the top of the kilns and dumped in the usual way.

The machinery for handling the burned lime as it is drawn out at the bottom of the kilns is unusual and interesting. When the gate at the bottom of a kiln is opened, the burned lime passes by a chute to a Link-Belt back carrier, changed to be continuous, passing in front of all the draw-gates and

Screw Conveyor Feeding Pulverizer of Hydrated Lime



Back Carrier Altered for Continuous Conveyance of Burned Lime from Bottom of Kilns to Top of Storage Tank



Shaking Screen. Portable Belt Conveyor for Loading Freight Cars and Trucks

Conveyor from Burned Lime Storage to Crusher in Hydrating Plant

Elevator at Right Carries Coal from Track to Firing Floor. Elevator in Center Delivers from Crusher to Revolving Screens Above Bin at Left

Hammer-mill Served by Belt Conveyor from Drying Kiln

extending to the top of the steel storage tank. This is shown in two of the illustrations. The storage tank has a capacity of 200 tons.

From this storage tank, the burned lime may go in either of two directions. First it may be drawn into a shaking screen to separate the lump lime from the powder. The lumps drop to a portable Specialty belt conveyor used for loading freight cars and trucks. The fines drop to a Link-Belt conveyor.

Hydrating Plant

If lump lime is not desired—about 80 per cent of all the burned lime is hydrated—the contents of the storage tank are drawn off directly onto the same Link-Belt conveyor on which the fines from the shaking screen are deposited. This carries the lime to a Sturtevant crusher. The ground lime is then taken by a Link-Belt elevator to a 25-ton storage tank which feeds by gravity into the Clyde hydrator. From the latter, the hydrated lime passes through a chute to a screw conveyor which feeds the Whirlwind pulverizer. It is said that this is the first hydrating plant in which this type of pulverizer was ever installed and the owner of this operation reports that the results have been very satisfactory. After this last pulverizing operation, the lime is deposited by a Latimer elevator in the storage tank over the Bates valve-bag packer.

A description of the plant would not be complete without mentioning the coal elevator which was installed by Johnson and Hoehler. It is simply a bucket elevator, shown in one of the illustrations which takes the coal from a hopper underneath the gondola cars direct to the firing floor. It has proved a satisfactory labor saver as, by it, a car can be unloaded in two hours. The small amount of attention which it requires is given by the kiln fireman at odd moments.

Asbestos-Cement Sheets Imported To South Africa

Imports of asbestos-cement sheets totaled 2,715,203 square feet in 1927, compared with 2,725,243 in 1926, according to *Commerce Reports*. The bulk of the 1927 importation came from the Netherlands and the United Kingdom.

Locally made roofings run from 15 to 20 per cent asbestos and 80 to 85 per cent cement. The fiber formerly used was chrysotile in one-fourth to one-half inch fiber lengths. At present it is being blended with amosite in the same length fiber.

Laying costs for asbestos-cement roofing are relatively low, as the sheets usually are anchored to perlings about 3 feet apart. In some cases where smaller sheets are used they are placed on 10-inch batons. Several attempts have been made to popularize asbestos shingles, but with small success. Several factors militate against the use of asbestos shingles in that district—particularly the high cost of solid wood deck and the buckling and curling of the shingles in long periods of drought, which condition is aggravated by heavy periodical rains.

First Contract in $30,000,000 Program

The first contract to be awarded in the $30,000,000 road and bridge construction program of the Louisiana Highway Commission, Baton Rouge, will be for paving the Old Spanish Trail to Crowley, to be awarded May 7. The road will be 18 feet wide and will involve the construction of a bridge over Bayou Blanc, about half way between the two cities.

Finishing Lime Association of Ohio Appoints District Engineer

A. P. Bick has been appointed by The Finishing Lime Association of Ohio as district engineer for the territory embracing Chicago, Minneapolis, St. Paul, northwestern Indiana, and Wisconsin. His office is in Chicago.

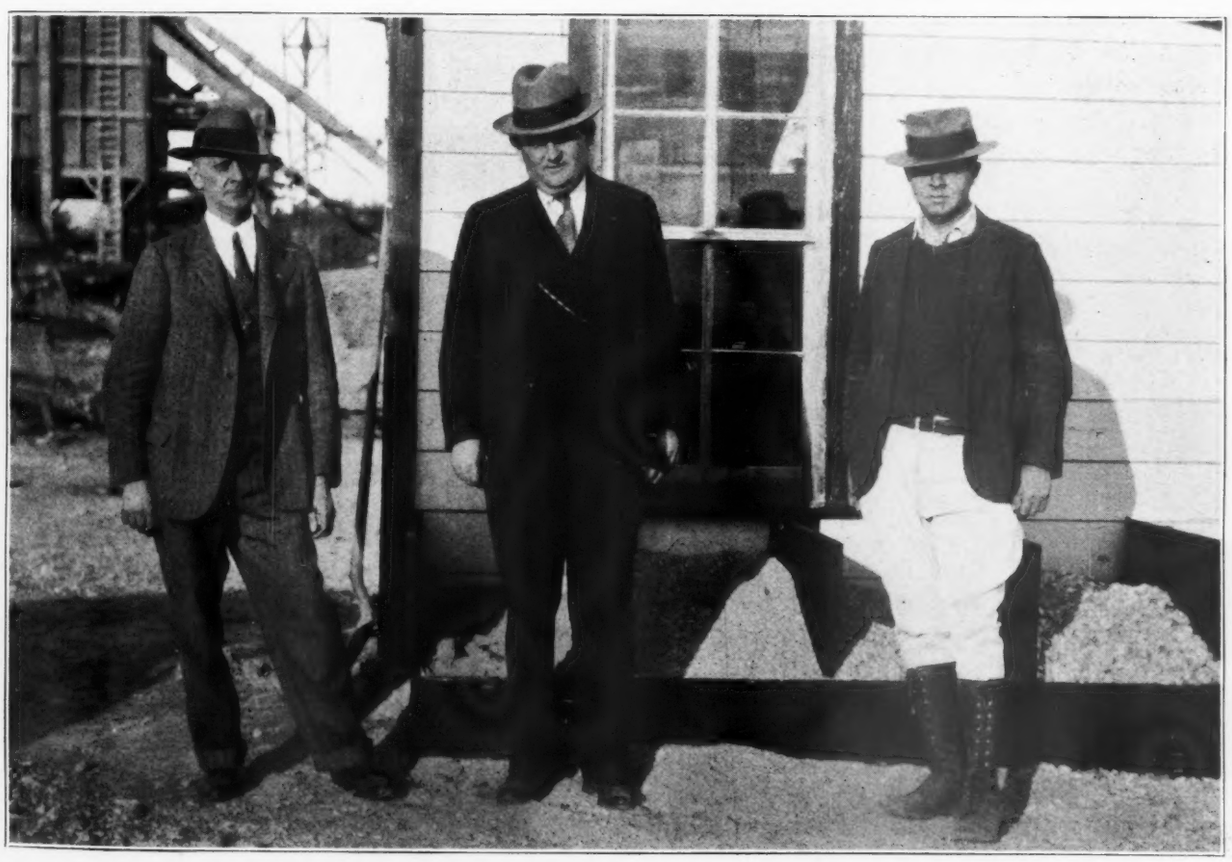
The American Chemical Society held its seventy-seventh meeting, April 29 to May 3, with the Columbus Section, at the Neil House as general headquarters. Simultaneous sessions were held by the sixteen divisions of the society.

Sand and Gravel Plant in Southern Tennessee One of Few in That Part of South

THE Estill Springs Sand and Gravel Company at Estill Springs, Tennessee operates one of the few sand and gravel plants in that section. Although not a large operation, having a capacity of 500 tons per 10-hr. day, it serves a large territory, most of the gravel being used for road work.

The property on which the plant is located consists of 200 acres of level lowland 1 mile west of Estill Springs and is bounded on the east by the Elk river. The overburden of sandy clay averages about 2 feet deep and the deposit is about 15 feet in depth. Stripping is now being done by a Marion Type 36 steam dragline with caterpillar traction and handling a 1¼-yd. Page bucket.

Excavating of the material is being done by a Street Brothers 500-ft. span dragline cableway unit consisting of a Street 1¼-yd. rear dump bucket, a 95-ft. steel mast and a two drum electrically operated hoist. Leschen "Red Strand" cable is used exclusively for operating and guy lines. The hoist is direct driven by a 100-hp. electric motor and is located in a house near the plant at right angles to the cableway.



Upper Right: View of Estill Springs Plant from Southwest. Lower: Left, S. R. Puryear of Perfect Classifier Company. Center, W. L. Hailey, Manager Estill Springs Sand and Gravel Company. Right, L. G. Banner, Superintendent

The Two Sand Classifiers at the Estill Springs Plant

The bucket dumps through a rail grizzly spaced at 6 in. into a steel hopper at the top of the plant. This hopper discharges through a sliding gate into a Morrow 32-in. by 16-ft. revolving screen equipped with a 5-ft. scrubber section and a ¼-in. sand jacket. This screen is belt and gear driven by a 10-hp. Westinghouse motor. It divides the gravel into the three sizes specified by the State Highway Department, 2¼ to ¼ in., 1½ to ¼ in., and ½ to ¼ in., known respectively as Class B, Class A and pea gravel. The three sizes of gravel go direct to bins while the material passing the ¼-in. jacket goes to two Perfect classifiers, one a Size 44 and the other a Size 48, which separate into concrete and building sands.

The five sizes of material are stored in five separate bins, with a total capacity of 200 tons, which discharge through segmental gates into cars on a track under the bins. These gates, as well as the hopper gate, are of Morrow manufacture. Washing water is furnished by a 5½-in. centrifugal pump in a pump-house on the bank of the river 850 feet east of the plant. Westinghouse motors, starters and controllers are used throughout the entire plant which is also equipped with flood lights for night operation.

The product is shipped out over the Nashville, Chattanooga and St. Louis Railroad, which is connected to the plant by a 1¼-mi. switch track, to points within a radius of 150 miles. L. G. Banner is superintendent of the plant. The main office of the company is in Nashville.

The Rear Dump Cableway Bucket Lowered for the Night

The Two-Drum Hoist Which Operates the Dragline Cableway

A Small Operation in Vermont That Produces Ground Soapstone

THERE is a small but interesting operation at Chester, Vermont, known as the American Soapstone Finish Company. Its product is ground soapstone used mainly for roofing paper. The stone is not of a quality suitable for sawing into slabs, but it is a particularly good kind for the purposes to which it is put and it commands an exceptionally high price. The Bird Company of Boston is one of its principal consumers.

The quarry is located in an unusually beautiful spot—even for Vermont—on a hillside above the well-kept farm lands in a small valley about two and one-half miles from the company's mill in Chester village. The operation has been under way for some eighteen years, so a rather deep pit has been made (110 feet). About 5,000 tons of soapstone are produced each year and operations are carried on all winter in spite of the severe weather. Cold and snow do not seem to be a deterrent, but when the spring thaw sets in the quarry is so wet that it cannot be worked for about a month. As soon as the snow has gone the Fairbanks-Morse pump is started and work resumed as soon as the quarry is dry.

Since the stone is soft and of a rather friable nature, drilling and blasting are simple matters. A Sullivan jack-hammer is used for drilling and 40 per cent Dupont dynamite for blasting. The jack-hammer is supplied with air by a Sullivan compressor and this is driven by a Fordson tractor

Feeding the Primary Crusher

Stored Soapstone at Plant

Hoist House at Quarry

installed for that exclusive purpose. There is no electrical power available here.

Stone is raised from the pit in skips by means of an American Hoist and Derrick Company hoist equipped with Roebling wire rope. The rope has been in service since the quarry was opened or, as already stated, no less than eighteen years. Apparently it is still in perfectly serviceable condition. The same is true of the hoisting engine. It is steam-driven and supplied from a Dillon vertical boiler.

The manufacturing plant is on the Rutland Railroad in the village of Chester. Freight shipments are thus greatly facilitated. Raw material is transported here from the quarry in a Graham truck and considerable storage space has been provided in order to keep the mill supplied during the spring period when the quarry cannot be operated and when the side roads are not in condition for trucking.

(*Continued on Page* 69)

Glimpse of the Quarry

Skipload of Stone at Top of Quarry

Limestone Produced From This Wyoming Mine Is Used in Beet Sugar Refining

Large Volume of Production Is Attained by the Filled-Stone System at Horse Creek, Wyoming, Quarries of the Ingleside Limestone Company, a Subsidiary of the Great Western Sugar Company

By JOS. C. COYLE

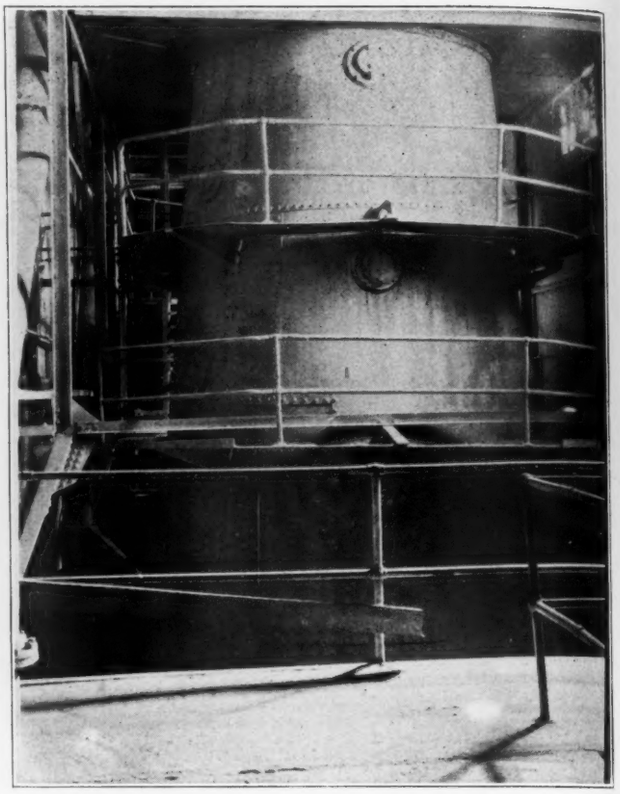
FROM 218,000 to 270,000 tons of limestone are required yearly at the factories of the Great Western Sugar Company, in the process of making beet sugar, and the problem of supplying this stone is by no means a small one. Several quarries have been opened in northern Colorado and southern Wyoming, but conditions at most of them preclude their operation on a large scale. Softness of the limestone, the presence of sandstone, agate, and other waste rock, as well as the presence of magnesium in the limestone itself are some of the factors which have proved troublesome in the operation of these quarries.

The largest and most economical production of limestone is accomplished at the Horse Creek, Wyoming quarry, which is operated as a mine, the strata being only about 20 degrees off vertical. About sixty men are employed at this plant, and about 9,000 tons of limestone are shipped monthly to the factories. The veins or beds were first worked in 1912 as an open quarry, but this effort was soon abandoned because the pitch of the measures made such operations dangerous and impractical. In 1920, a tunnel was driven on one of the veins to determine the practicability of mining methods. One hundred and fifty feet of stoping ground was secured, and a sizing screen was installed, the rock being lowered from the tunnel mouth, in the saddle of the hill, on the same gravity tram that had been used for the initial workings.

This experiment proving satisfactory, prepara-

Hotel and Screening Plant at Horse Creek, Looking Down from Reservoir on Mountainside

Feeder and Swinging Chute to Picking Belt

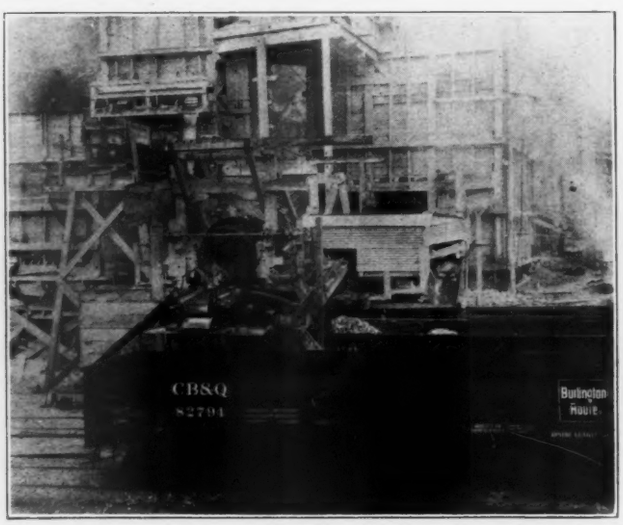


One of the Belgian Kilns in Sugar Factory

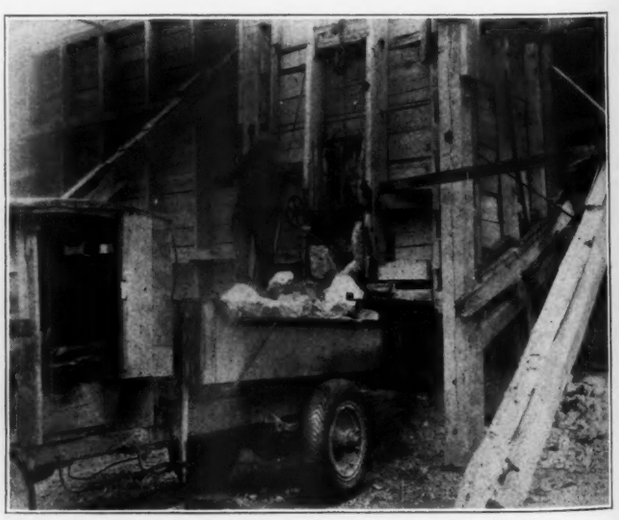
tions were made, in 1924, for operating on a large scale. A dormitory was built, bunkers were constructed, an air compressor installed, and a tunnel was driven from near the foot of the hill to cut the vein which had been worked on the upper level. However, what had been a 35-foot vein of good limestone at the upper level, carried from 16 to 18 feet of magnesium limestone where cut by the latter tunnel. At 190 feet farther, the tunnel cut the other vein of limestone which proved to be of the same thickness (23 feet) as on the surface and of good quality. The crosscut tunnel at this point is about 1,000 feet in length.

It was assumed that the deposit of magnesium in the 35-foot vein was only a local condition—from water filtering down along faults in the saddle of the hill, under which the cross-cut was driven—so drifts have been driven on both veins, in each direction from the main tunnel. This development has proved the assumption correct. The strata of magnesium rock have greatly diminished as the drifts get farther from the saddle, and it is hoped that they will finally disappear.

The filled-stope or shrink method of mining is used. An 18-foot tunnel is driven along the hanging wall of the vein, with a double track for loaded and empty cars. Upraises, about 6 feet by 8 feet, are driven at approximately 35 degrees off hori-

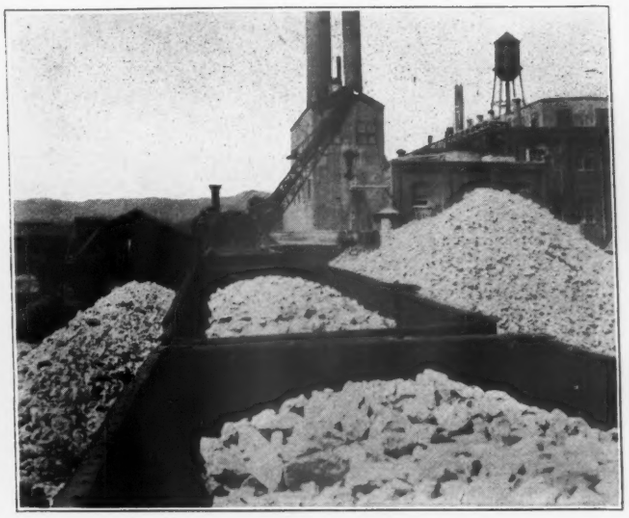


Loading Facilities at Horse Creek Plant



Loading the Larger Waste Rock from Grizzly

Breaking Rock Through Grizzly



Storage Yard at Loveland, Colorado, Plant of Great Western Sugar Company

zontal, on the footwall side of the tunnel and about 35 feet apart. These are driven upward about twelve to fourteen feet, and chutes are installed in the openings over the track. A horse is used to spot the cars beneath the chutes until from four to six 3-ton side-dump mine cars are loaded, when the trip is drawn to the outside with a Fordson gasoline motor, mounted on a McFarlane-Eggers mine locomotive chassis. So strong is the current of air in the mine that there is absolutely no trouble with the exhaust from these motors.

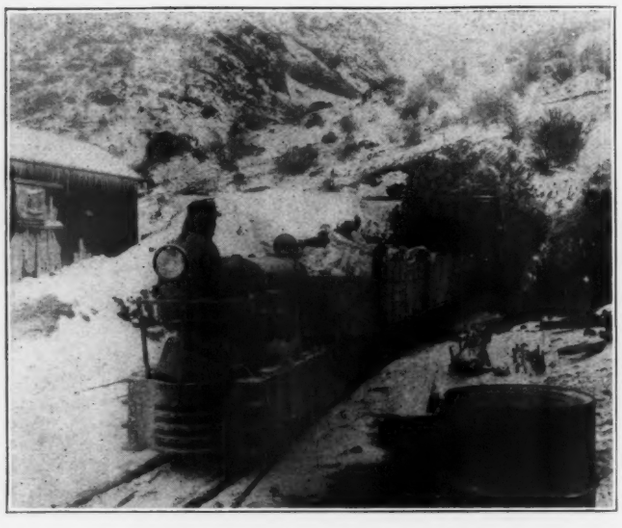
From the upraises, stopes are widened to the full width of the vein, and the rock is shot down from overhead until the surface, 220 feet above, is reached. Rock is drawn from the chutes from time to time so as to lower the surface of broken rock sufficiently for machines to be set up and operated. Fortunately the hanging walls of both limestone veins are of quartzite, about twelve feet thick, with a ten-foot vein of limestone as a backing, so that they stand for the entire 220 feet without timbering of any kind. Were timbering required in the stopes, the cost would be prohibitive, according to W. M. Rex, who directs all quarrying operations of the company.

A number of Ingersoll-Rand N-72 and L-70, Waugh 337, and Gardner-Denver rock drills are used in the mine. Frequent sharpening is not required, a set of six bits sometimes running a week. Eight-foot rounds are shot in the headings, and 18-foot holes in the stopes. In the latter holes 17 special, a bulky dynamite manufactured by the Giant Powder Company, is used; and twelve to sixteen holes are fired at a time, using fuse and caps. From 50 to 150 tons of rock is broken at a round. A 40 per cent to 60 per cent gelatin dynamite is used in the headings. Such dynamites are purchased from the Hercules Powder Company and the DuPont Powder Company.

Very little water has been encountered and, as

Turning an Upraise

Drilling in a Stope



Train Leaving Mine with Load of Rock

One of the Loading Chutes at Mouths of Stopes

mentioned before, the air is excellent, ventilation being secured by breaking through into the upper level, where a small strip of limstone is left in place to support the hanging wall of the veins.

Much trouble was experienced, at first, in sorting out waste rock. This was of different colors such as red, white, pink, and yellow but, when covered with lime dust, it all looked very much alike. After much experimenting and the installation of a series of pick-belts, good results are now obtained in this respect.

When drawn from the mine, the cars of rock are dumped onto a home-made grizzly of 85-pound rails, and 15 feet by 72 feet in size, with a 5-inch space between the rails. Here the larger pieces of inferior rock are sorted out, placed upon small cars on a track at the back of the grizzly, and later dumped through an opening into a 50-ton waste bin at the side of the plant, from which it is hauled in trucks. The rest of the rock is broken through the grizzly into the bunkers which hold 500 tons.

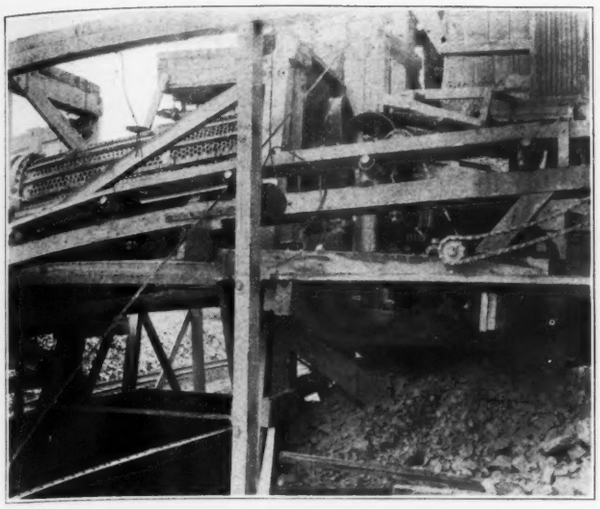
From these bunkers five Link-Belt feeders, separately controlled, move the rock onto the big 36-inch pick-belt which is 79 feet long. Five swinging metal chutes, touching the surface of the pick-belt, distribute the rock from the feeders to the belt. The latter, which is made by the Boston Woven Hose & Rubber Company, is five-ply, has been in use for four years and is still in excellent condition. It delivers the rock to a 52-inch specially constructed sizing screen, which is 24 feet long and is erected over two of the railroad spurs. This screen was furnished by the Ajax Iron Works.

Directly under this screen are two 18-inch conveyor belts, running backward toward the plant. The first of these catches the chat, or fine stone from the first half of the screen, and dumps it into a hopper at the bottom of a bucket elevator, which carriers it up to a small screen at the top of the bins. Two 30-ton bins are located beneath this screen, the finest of the chat dropping through into the first of these, the waste bin, to be hauled away in two-ton Western dump cars drawn by a horse. The coarser rock goes over the end into the second bin to be sold for concrete aggregate, railroad ballast, or any other purpose for which there happens to be a demand. When there is no such demand the chat is all run into the waste bin and hauled away.

The second belt, beneath the sizing screen, receives the finer rock, ranging from 2 inches to 4½ inches, which is shipped to the sugar factories.

This rock is carried back midway of the sizing screen and dumped onto a 14-foot pick-belt, which is running at right angles to the sizing screen. A man stationed at this belt picks out inferior rock and tosses it upon the waste belt, which is 16 inches wide and runs back towards the plant. The good rock passes over the pick-belt into a metal chute and is turned into the car which is being loaded. At the extreme end of the sizing screen is another pick-belt, 30 inches wide and 8 feet long, which carries the larger rock from the end of the screen into the car on the third track. Two pickers are

Grinding Mill in Plant of Great Western Sugar Company



Rear End of Sizing Screen, with Sections of Picking Belt and Waste Belt

stationed at this belt to remove the waste rock from this larger size and to throw it upon the waste belt, previously mentioned.

This waste belt is 35 feet in length and discharges its contents to a second belt of the same width but which is 76 feet long and runs the entire length of the bunkers, receiving the waste rock taken from the big pick-belt beneath the bunker chutes. This waste from all the pick-belts is dumped from this belt to a bucket elevator 45 feet long, which feeds to a 10-ton elevated bin from which it loads into dump wagons to be hauled away.

At certain times when the railroad uses all the chat for ballast, the first spur track, or the one nearest the plant, comes into use. The first belt beneath the sizing screen is then removed, and a loading chute substituted, which carries all the chat directly into the car. The two pick-belts which receive rock from the sizing screen were installed because the inferior rock is much easier to distinguish from the good limestone after passing through the screen and losing its coating of dust. Two Ingersoll-Rand X.P.V. compressors, of the Imperial type, furnish air for the mine, and power is derived from a 250-hp. marine type boiler.

Because of the isolated location of the camp, the employes are largely single men, for the accommodation of whom the company erected a neat brick hotel with 24 rooms, kitchen, dining room, and wash rooms, the latter being fitted with hot and cold running water and shower baths. A Delco lighting system is used in the hotel, and water is pumped to a 32,000-gallon reservoir about one hundred feet above the building on the mountainside, giving ample pressure to the supply of water. At this writing, six modern terraces are under construction for the accommodation of married men who wish to live with their families near the quarry. Three of these terraces will contain four 3-room apartments each, the other three will have three 4-room apartments each, all with hot and cold water and strictly modern in every respect. There is always the problem of labor turnover, especially among single men, in isolated locations. The erection of these new dwellings is expected to eliminate much of this difficulty by enabling more married men to be employed, and furnishing comfortable homes for their families.

The quarry is operated the year round and, at each of the factories 20,000 tons or more of limestone is stored every year at the beginning of the manufacturing season. This is burned at the factories, in Belgian type kilns, holding 135 tons each. After burning, with a mixture of about 8 per cent coke for fuel, the lime is removed from the kilns, ground in Raymond grinders and is ready for use in converting the season's sugar beet crop into sugar.

Resume of Construction Projects In Canada

Construction work planned in Canada, as reported by Assistant Trade Commissioner L. A. France, Montreal, in *Commerce Reports*, includes the following projects: Several silos with an aggregate capacity of 100,000 barrels for storing cement, and a $184,000 subway, Toronto; a $400,000 warehouse, a $1,500,000 apartment house, two subways to cost $880,000, and two bridges to cost $1,700,000, Montreal; a $1,000,000 bank headquarters and office building, Ottawa; a $200,000 apartment house, Windsor; two apartment blocks costing $275,000, Regina, Saskatchewan; a $500,000 motion-picture theater, Halifax; a $1,000,000 community hall, Hamilton, Ontario; and a $500,000 filtration plant, Niagara Falls, Ontario.

Cement Production Normal In Europe

The production of cement in Europe is back to normal, with a renewed strong domestic and export demand, according to *Commerce Reports*. Despite the adverse effects of coal prices on production costs, all factories have entirely recovered from the slump that occurred during the cold spell.

Plant Produces Soapstone

(*Continued from Page* 64)

Stone is fed by hand into a small Good Roads Machinery Company jaw crusher, elevated to a chute leading to a Sturtevant rotary fine crusher from the bottom of which it is again elevated to a chute leading to a Sturtevant mill. From this an elevator discharges into a series of chutes and elevators to two revolving screens which grade the material. Other small elevators and chutes deposit the different grades in bins with bagging spouts below. One motor drives the whole plant.

Phosphate Losses in the Land-Pebble District of Florida*

By H. M. LAWRENCE†

IN THE land-pebble district of Florida a lively interest in the possibilities of obtaining increased recoveries of phosphate rock is evident. Research in several directions is being carried on by companies operating in the district to increase the yields obtained by the washing plants. The Bureau of Mines is cooperating with this research program to promote more efficient plant practice and to avoid unnecessary depletion of mineral resources.

Washing practice, as carried on in the district at present for the recovery of phosphate rock from the crude ores or matrix, is not a complicated process. Flow sheets of the several companies are similar, although the equipment varies with the preferences of the individual operators. For disintegrating the matrix, log washers are favored, although revolving drums equipped with flights to break up lumps of clay are also used. Fine sand is removed by screening. Vibrating screens have become well established in the district, although stationary flat screens and trommels are also employed.

Losses of Phosphate in the Finer Sizes

Of the phosphate that is not recovered by present washing methods, the greater portion is in the finer sizes. In these sizes the phosphate grains are accompanied by grains of sand—largely quartz—of the same size, and recovery of these phosphate grains as a commercial product is not possible by simple washing methods. Phosphate recoveries approaching complete extraction can be effected only by applying metallurgical processes, either mechanical or chemical. As yet, most of these processes have not advanced much beyond the laboratory or perhaps the pilot-plant stage. Such processes may have some application to the beneficiation of phosphatic ores or washer rejects, but a discussion of them is not within the scope of this paper.

Avoidable Losses

Other than trash, stray pieces of bone, and sand rock, clay balls, etc., which are usually removed from the pulp in coarse trommels at the head end of the washer, the material ordinarily discarded as waste is smaller than the opening—14- to 20-mesh or 0.046- to 0.03-inch—of the finest screen in the plant. However, in representative samples of washer rejects a considerable percentage of material is frequently found that analyzes above the minimum commercial grade—69 per cent B.P.L. or bone phosphate of lime. Part of this commercial material is in sizes slightly finer than the limiting screen used in the washer, and part of it is somewhat coarser. The presence of phosphate rock coarser than the screen opening may be due to several factors, some of them inherent to hydraulic mining operations. Among these factors the following may be mentioned:

Greatly varying volumes of pulp delivered to the washers from the pits, which surge through the washer and overload logs and screens.

Rapid enlargement of the openings in certain types of screen surfaces.

Rigid requirements as to grade of rock produced. Screens with a larger opening than is indicated by the screen analysis are used to maintain grade when plants are pushed to production and, when underloaded, these screens pass commercial rock. When screen tests indicate that certain sizes are commercial in grade, such losses should be considered avoidable. Reclamation of this material does not require the application of processes with which the district is unfamiliar.

In Table 1 certain data obtained from studies of washer rejects—locally called debris—are presented. For washer 1 the data given are averages obtained from studies of four representative samples taken at intervals during the past year. The

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†Metallurgist, U. S. Bureau of Mines, Southern Experiment Station, Tuscaloosa, Ala.

Table 1.—Analysis of phosphatic sands from debris banks.

Washer No.	1 Analysis of sands, per cent B. P. L.	2 Commercial fraction of sands, weight per cent	3 Analysis of commercial fractions, per cent B. P. L.	4 Total phosphate contents of sands occurring in commercial fractions, per cent	5 Point of separation, mesh, Tyler standard sieve scale[1]	6 Analysis of non-commercial sands, per cent B. P. L.[2]
1	22.4	12.3	68.1	33.3	16.0	16.1
2	31.8	8.7	69.3	18.7	16.0	28.2
3	39.8	20.2	71.0	34.4	20.0	32.1

[1] Sizes coarser are commercial in grade, and sizes finer are non-commercial.
[2] If all the commercial material could be recovered.

Table 2.—Relation between washer production and commercial fractions in sand rejects.

	Long tons		Loss in slimes		Sands available			
Matrix mined	Phosphate rock produced	Waste	Weight per cent	Long ton	Long tons	Commercial material weight, per cent	Phosphate rock content, long ton	Long tons recovered at 80 per cent
5.....	1	4	20	0.8	3.2	6	0.19	0.15
4.....	1	3	20	.6	2.4	6	.14	.11
3.....	1	2	20	.4	1.6	6	.10	.08

data for washer 3 represent the analysis of a single sample. These samples were obtained by sampling test pits in several places in the debris piles. A cut down the side of a pit gave a fairly representative sample of three to four feet of the sands in place. The data given in Table 1 for washer 2 are averages of two samples, although the method used to obtain these samples is not known.

It should be noted that these samples do not represent the total material discarded to waste by the washers, since clay and some fine sand are carried into settling ponds as a pulp after the sands have been deposited on the piles. The percentage of the total washer rejects that is not dropped on the debris piles varies with the character of the matrix mined. Data on this factor are meager. These samples should, therefore, be considered as indicative in character. Systematic sampling of the current washer rejects and of the debris banks is necessary to establish quantitative data.

An examination of the data in Table 1 shows that 8 to 20 per cent of the weight of the phosphatic sands so far studied is commercial in grade. Furthermore, of the total phosphate content of these samples, 18 to 34 per cent is found in sizes that analyze above 68 per cent B. P. L. The point of separation between commercial material of the analyses given in column 3 of Table 1, and noncommercial sands, is at 16-mesh for the samples from washers 1 and 2, and at 20-mesh for washer 3. If the maintenance of grade of the rock at the B. P. L. analyses given in the table is not essential, some slightly finer sands could be included. Inclusion of the minus 16-mesh and plus 20-mesh fraction with the plus 16-mesh material for washer 1 would lower the grade of the total plus 20-mesh material to 67.1 per cent B. P. L.; the weight per cent and per cent of phosphate content would be increased from 12.3 per cent to 14.9 per cent and from 33.3 per cent to 41.4 per cent, respectively; while the analysis of the noncommercial sands would be decreased from 16.1 per cent to 14.6 per cent B. P. L.

The data given above are interesting, but it is realized that these figures cannot be applied directly to conditions in the land-pebble district. Some relation between these data and the present washer output of phosphate rock must, if possible, be determined. Although several factors are uncertain, an analysis of the available data has been attempted and the following discussion is presented. To serve as a basis for this discussion, the ratio of 4 long tons of dry matrix mined to 1 long ton of dried phosphate rock produced is used. This ratio is rather closely approximated by some of the companies. Other ratios may be used without affecting the argument.

If 4 long tons of dry matrix are mined and 1 long ton is recovered as phosphate rock, then 3 long tons of material would pass to waste. Assuming that 80 per cent of the washer rejects is deposited as sands in the debris banks and that the remainder passes to settling ponds, then there would be 2.4 tons of discarded sands to which the data of Table 1 are applicable. In the representative samples that have been studied, the lowest weight per cent for the proportion of commercial fractions that has been found was 6.3 per cent. Applying this to the 2.4 long tons of sand rejects, there would be available for recovery 0.15 ton of phosphate rock. If 80 per cent of the available commercial fractions could be saved, the additional amount recovered would be 0.12 ton of phosphate rock for each ton now recovered by the washer, an increased yield of 12 per cent.

In Table 2 are presented data which show the amount of phosphate rock available for recovery in debris banks. Various ratios between the matrix mined and the phosphate rock recovered have been chosen. Six per cent—a minimum for the samples so far studied—has been taken as the weight per cent of the commercial fractions in these phosphatic sands. Had a higher figure been used for this factor, the phosphate rock content available for recovery would be increased proportionately. Also, these estimates would be affected by substituting higher or lower figures for the weight-percentage lost from the total washer rejects as slimes and the finest sands.

Recovery of Commercial Fractions

The recovery of these commercial fractions should be neither difficult nor expensive. If applied to current washer rejects, equipment will be required to effect a preliminary separation at 28-mesh to 48-mesh. The coarser sands can be cleaned by screening at the desired point of separation, and the finer sands and slime discarded. Rake

(Continued on Page 74)

Workmen's Absenteeism Has Been Decreased 200 Per Cent by a Personnel System

By J. J. BERLINER

ABSENTEEISM can be reduced and, in the process, records can be secured which will facilitate the weeding out of the less desirable employees when the payroll has to be reduced. A little over a year ago, one manufacturing company had an absentee record of 24 per cent. Through the methods of an employment manager, that record was reduced to 8 per cent in less than a year.

But the results of the application to this company's problem of the principles which are the basis of the plan described here are more definite and reach farther into the heart of the business than might be concluded from the mere mention of the fact that the number of absentees is only a third of what it used to be.

It means that the factory output has been increased materially, that the men are more content to work there than they were before, and that the labor turnover is considerably lower than the figure formerly held as a minimum. In other words, the cost of production shows, in its decline, the benefits that have been secured.

The system involves no expenditures beyond those for a small office force to operate it, and it depends upon a factor often overlooked in industry—human emotions.

No bonuses, no rewards, no fines, no shouting and fireworks are a part of the system. It is nothing more complicated than the playing of one man's pride against another's, or, in a more general sense, playing the collective pride of one department against the collective pride of a rival department, and supplementing this human competition with the assurance of a square deal. It capitalizes inter-shop jealousy.

REPORT OF IRREGULAR ATTENDANCE

DEPT. A SHOP — WEEK May 10 to 15, 1928

A Absent with permission of foreman.
B Absent, no reason known.
C Reported sick or disabled.
D Reported sickness in family.
E Verified report of disability.
F Injury received at plant.
G Company business.
H Death in family.
L Laid off; slack work.
R Released.
V Vacation.

Please supply information and return to the Employment Department

Monday			Tuesday			Wednesday			Thursday			Friday			Saturday		
No.	In Late	Out Why	No.	In Late	Out Why	No.	In Late	Out Why	No.	In Late	Out Why	No.	In Late	Out Why	No.	In Late	Out Why

The Attendance Record Shows Up a Shop's Weak Spots

The results of the absentee investigations are tabulated daily. When the employee knows that this is an important and permanent record, which is going to be used, he takes a new interest in getting to work on time.

ATTENDANCE RECORDS FOR WEEK OF
May 10-15, 1928

Main Office	85 per cent
Sales Dept	70 per cent
Shipping Dept.	90 per cent
Dept. A	91 per cent
Dept. B	90 per cent
Dept. C	95 per cent
Dept. D	98 per cent
Assembly Room	89 per cent
Finishing Room	90 per cent
Average for all offices	81 per cent
Average for all shops	92.1 per cent
Average for factory	86.8 per cent
Factory average, last week	98.5 per cent

(Signed)
GENERAL MANAGER.

Each week every foreman gets a memo that shows him where his shop stands in comparison with the others.

One Way to Work on Pride

The system is not offered as a panacea for all modern industrial ills, but, as a matter of record, it has proved a successful cure for a number of them, and it has been a potent factor in the reduction of yearly turnover, in increasing punctuality and regularity in workers, in cutting down accidents, and in the settlement of petty wage disputes which, if neglected, often prove as expensive and disastrous as larger and more general complaints.

By compiling complete records of the regularity of attendance—by individual and by shop—and by putting one shop into competition with another for the best record, the company has succeeded, during a period covering ten months, in cutting down absenteeism, as already said, from 24 per cent of the payroll to less than 8 per cent.

Daily reports of absentees, as taken from the time-clock records, are sent by messenger to every foreman and department head. The foreman and various managers make an investigation to determine the cause of absence, and then report to the personnel department the results of their investigations. The personnel department, which is headed by the employment manager, in turn sends out investigators to check up and supplement the foremen's reports. This is done primarily to insure absolute accuracy for all of the records.

When a worker is found to be absent without cause, his negligence of duty to his employer is called to his attention from the practical viewpoint of business loss. Invariably, when the employee finds that his absence is being made a matter of record, he begins to take a new interest in getting to work regularly and on time.

Charts which show graphically the record of each shop and department are posted monthly in conspicuous places, and seldom is a foreman who finds his shop low on the list not moved to sudden effort toward bringing his shop record to a more creditable position on the chart. In a sense, the chart is a gage of foremen's efficiency—at least, they consider it as such.

At the end of each week, the personnel department posts throughout the shops another chart showing the comparative rate of punctuality in each shop department and office. Again the element of intershop jealousy and inter-foremen jealousy enters to play a prominent part. The foremen whose shops are low immediately get busy to see that they are not low the next week; those whose shops are high put forth new efforts to make them even higher. On February 15, 1928, the worst shop in this company had a punctuality record of 15 per cent. That meant that the average person in that shop reported punctually only 15 times out of 100. The second week of the system, without any urging other than the posted records, the low record was 22 per cent; the third week, 39 per cent; the fourth week, 44 per cent, and during the last week of October, the low record was 58 per cent.

The general punctuality record for all offices increased from 68.08 per cent on March 1 to 93.90 per cent on November 1. The actual value of this increased punctuality is apparent to any employer.

The company's expert claims that the reduction of absenteeism increased plant efficiency and aided in lowering costs. He says further, in commenting on this feature: "In estimating the value of reduction in absenteeism, the following features are worthy of consideration:

"1. When persons who are expected to report for work are absent, the planning of the activities of a department cannot be arranged so closely in advance of the day because no one can tell what particular employees are going to be on hand.

"2. Absences may occur in such a manner as to destroy the balance in the force—they usually occur by groups.

"3. Irregularity in attendance frequently breaks up the continuity of work. If a man is absent for a few days, after he has once become accustomed to an operation, and another has to be instructed how to continue it, production experiences a serious setback.

PUNCTUALITY MEMO

Week ending May 15	
TO FOREMEN DEPT A	
Shops average this week	92.1
Offices average this week	81.6
Your average this week	91
Your average last week	90
Signed A. M. Parker	

"4. There may occur absenteeism of such a nature that there are no men able to fill the places of the absentees. Then it becomes necessary to secure men from the outside to take the places of the irregular employees.

"5. When the working force is regular in attendance, it is not necessary to keep so many persons on the payroll; consequently it is possible to dismiss the least desirable and thereby to increase the average quality of the employees retained.

"6. Regularity in attendance is an important element of discipline. An employee who is accustomed to toe the mark in one respect will more readily observe all other regulations.

"7. By enforcing regular attendance, the employees earn a larger income each week. Then, when they look back over their earnings, they are much more contented with what they have done and with the plant where they work."

This company has found that comprehensive and reliable personnel records are invaluable to a large business organization. In compiling and keeping them, it emphasizes the fact that accuracy is a most essential feature. When properly kept, states this company, personnel records should be such that "any weak spot can be located immediately and the cause definitely determined."

For instance, when the time comes that workmen must be laid off, this company has no difficulty in picking out those that it can best afford to drop —those whose personnel records show the greatest number of "times late" and "times absent." Knowledge that this is the company's method of procedure has a decided steadying effect upon the workmen.

Phosphate Losses

(*Continued from Page 71*)

classifiers of the bowl type, cones, or drag classifiers are available for the first separation. Such equipment is obtainable and its operation is not complicated. Operations, however, ought to be carefully controlled to obtain the maximum benefit from an auxiliary plant. The installation costs are estimated at $20,000 to $25,000. Based upon a low-tonnage recovery, operation costs, including charging off the installation costs of the plant, are estimated at 30 cents to 40 cents per ton of fine rock saved. With higher recoveries, costs would be less. If the reclamation of a debris bank were to be considered, the costs would be somewhat higher, as the sands would have to be mined and pumped to the plant.

The problem of eliminating avoidable losses by recovering a higher percentage of the commercial fractions in the phosphate matrix mined is being carefully studied by the operators in the district. Several methods are being considered. In some plants it may be possible to effect the indicated additional recoveries by rearranging the washer flow-sheets and by using screens with smaller openings. In other washers, an auxiliary plant, such as has been discussed in this paper, will be necessary. A plant of this type should be suitable also for the re-treatment of such debris banks as may contain sufficient phosphate in commercial fractions to promise profitable reclamation. Washers have been proposed in which complete disintegration of the matrix would be secured before any fractions, other than clay and very fine sand, are rejected. If operations are carefully controlled, any of these washing plants should yield increased recoveries of phosphate rock as compared with present practice.

Summary

A study has been made of the debris bank sands now accumulating in the land-pebble phosphate district of Florida. This study shows that:

(1) The greater portion of the phosphate discarded by the washers is in the finer sizes —below 16 to 24-mesh. These fractions analyze considerably less than 68 per cent B. P. L. Recovery of the phosphate in these sizes is not possible by simple washing methods.

(2) A proportion of the material now rejected by the washing plants is found in fractions of commercial grade—68 per cent B. P. L. or higher. Such fractions are, in general, coarser than 16- to 20-mesh. These losses should be avoidable. The relation of the phosphate so lost to the present washer production is discussed. Methods and estimated costs for reclaiming the commercial fractions are considered.

Kaolin Plant in Georgia Solves Difficult Stripping Problem

ONE of the few existing kaolin plants in this country is the operation of the Walker Georgia Kaolin Mines at Claymont, Georgia, about 20 miles from Macon. The plant is about 15 years old but was remodeled when taken over by its present owners about a year ago. The 125-acre property has all been drilled over to determine the extent of the deposit.

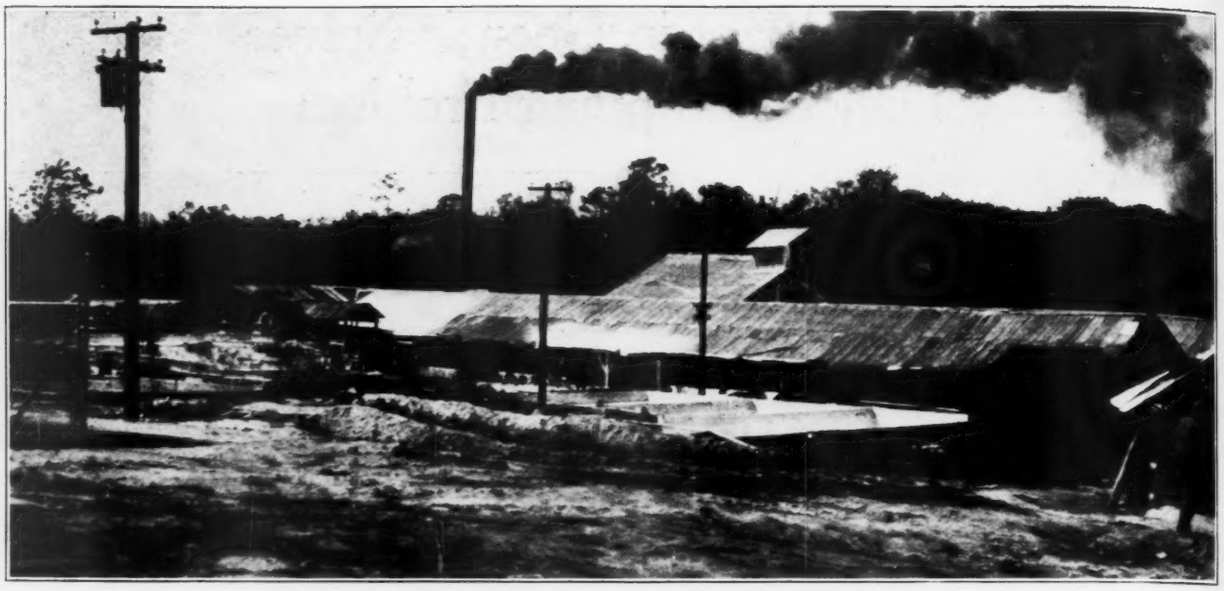
The overburden consists largely of a stiff hard clay which runs from 10 to 40 feet in thickness and is very difficult to remove, the hilly nature of the country adding to the difficulty. Several different methods had been used and proved unsatisfactory until about a year ago a Schofield-Burkett 1-yd. cable drag scraper was installed. This scraper is operated by an American Hoist and Derrick Company 2-drum steam hoist. Results were so satisfactory that it was decided a few months ago to use another scraper to open up a new pit. A Schofield-Burkett 1½-yd. cable drag scraper with a 60-ft. steel mast was installed and is now in operation. This unit is operated by a Street Brothers 3-drum steam hoist, steam for which is furnished by a Schofield 35-hp. boiler. Broderick and Bascom cable is used on both units.

The kaolin deposit runs from 8 to 30 feet in thickness and is mostly broken down in the pit by hand. Some blasting is necessary and holes for this purpose are made with hand drills. Hercules 60 per cent dynamite and safety fuse are used. The kaolin is then loaded by hand into Koppel 1¼-yd. steel side dump cars which are hauled ½ mile to the plant by a Fordson tractor converted into a locomotive.

Scraper Bucket Loading

The cars dump from a trestle at the plant into a pile from which the kaolin is shovelled by hand into a disintegrator with two knifed wheels, water being added. The resulting liquid is pumped by an

The Scraper Working in the Pit Removing Overburden



The Plant, with Settling Tanks in Foreground

8-in. centrifugal pump to sand troughs which settle all mica and sand out of the kaolin which then flows by gravity into a 140-mesh revolving screen. The material passing the screens flows to outdoor concrete settling vats where it is allowed to settle for 24 hours. At the end of this time the liquid has become thickened and is then pumped by a Fairbanks-Morse 2-cylinder steam pump into Patterson filter presses which compress the kaolin into solid discs. These are put into racks to dry. They are then crushed in a roll crusher which discharges into an elevator loading through a chute into box-cars on a siding next to the plant. A 150-hp. Schofield Iron Works steam engine operates the entire plant. The capacity of the plant is about 5,000 tons per month.

Shipments are made over the Central of Georgia Railway, the Savannah to Atlanta division of which runs by the plant. The kaolin goes mostly to paper mills, some in the vicinity, but others as far away as Wisconsin, New York, Michigan and even to Canada. Some of the kaolin is also used in pottery and pigments and as a rubber filler.

(*Continued on Page* 83)

Loading Cars of Kaolin in Pit

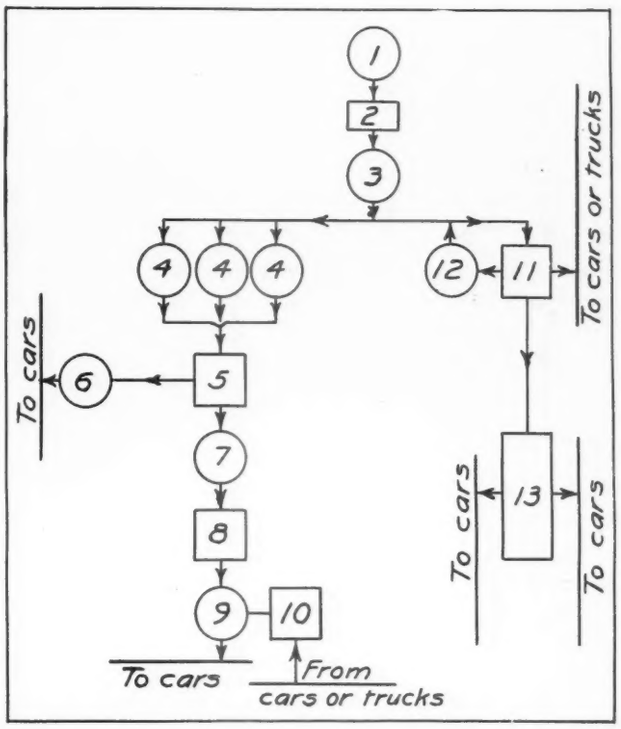
Ohio Hydrate and Supply Delivers Quality Product on Short Notice

THE plant of The Ohio Hydrate and Supply Company is located at Woodville, Ohio, frequently termed "the Finishing Lime Center of the World." It is the lime center of the state of Ohio, which produces more than one-half of the hydrated lime of the United States.

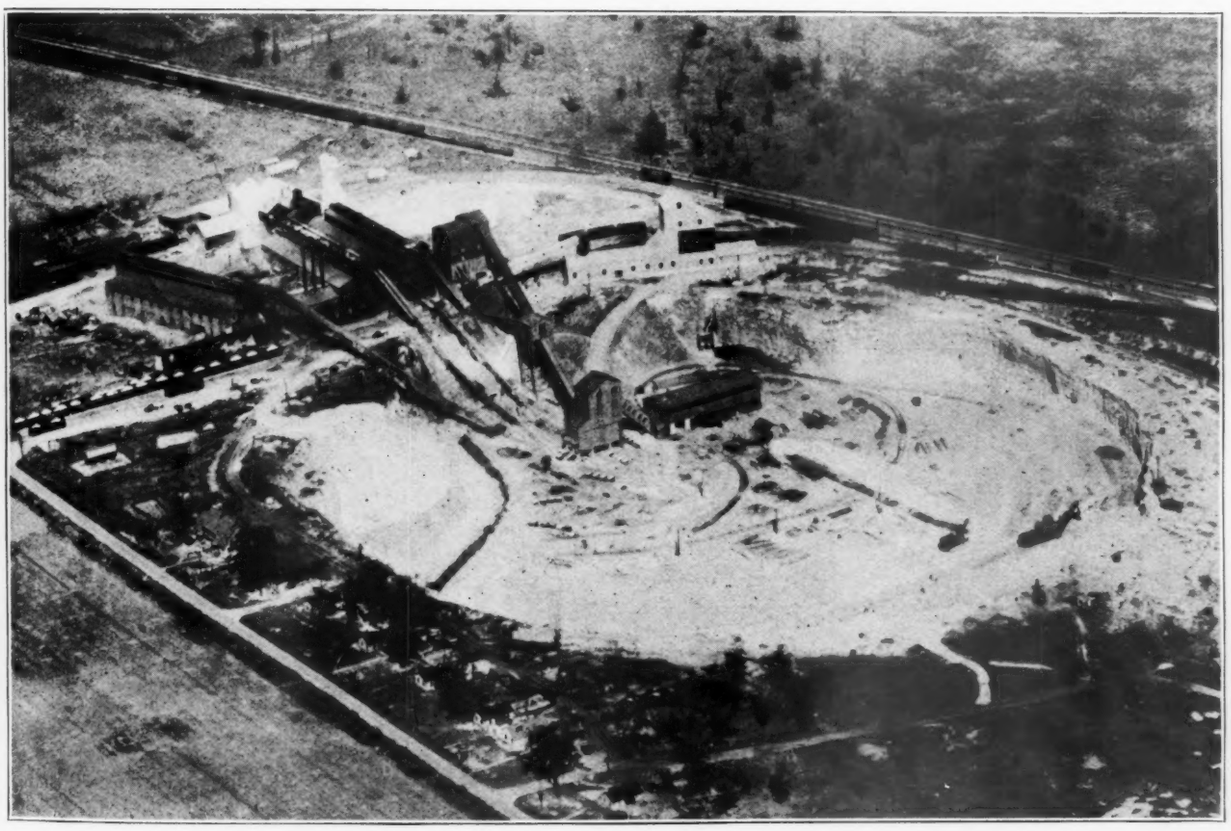
The company owns 336 acres of limestone land, of which the plant covers about 40 acres. By referring to the diagram, 1, indicates the 14 to 15 acres of open quarry. The stone has been classed Grade A by the State Highway Department and analyzes 99½ per cent calcium and magnesium carbonate.

Drilling is done by the three Loomis clipper blast hole drills. Holes are drilled ten feet from the face and ten feet apart and two rows, which are loaded with eight to twelve tons of dynamite and shot at one time. The face of the quarry is from 45 to 55 feet in height.

The entire plant is electrically equipped with approximately 150 individual motors. These motors range from 350-hp. for the heavy duty demands to 5-hp. motors for operating poidometers and light equipment. All of the buildings throughout the plant are fireproof. They are structural



Diagrammatic Flow Sheet of Products, The Ohio Hydrate and Supply Company, Woodville, Ohio

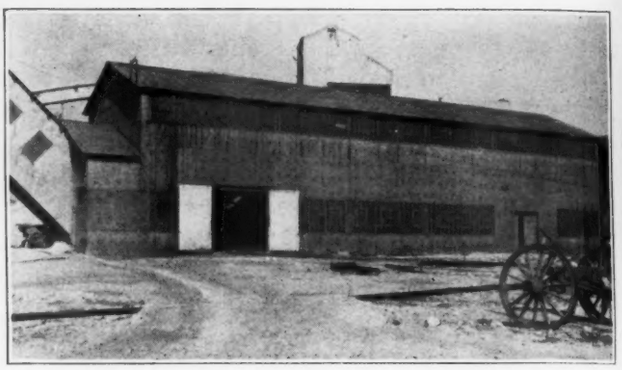


Aeroplane View of the Plant, Taken at an Altitude of 5,000 Feet

Screen Building For Primary Crusher. This Building Is So Located That Kiln Stone Can Be Drawn from the Side of the Bins and Conveyed by Electric Hoist to the Kilns.

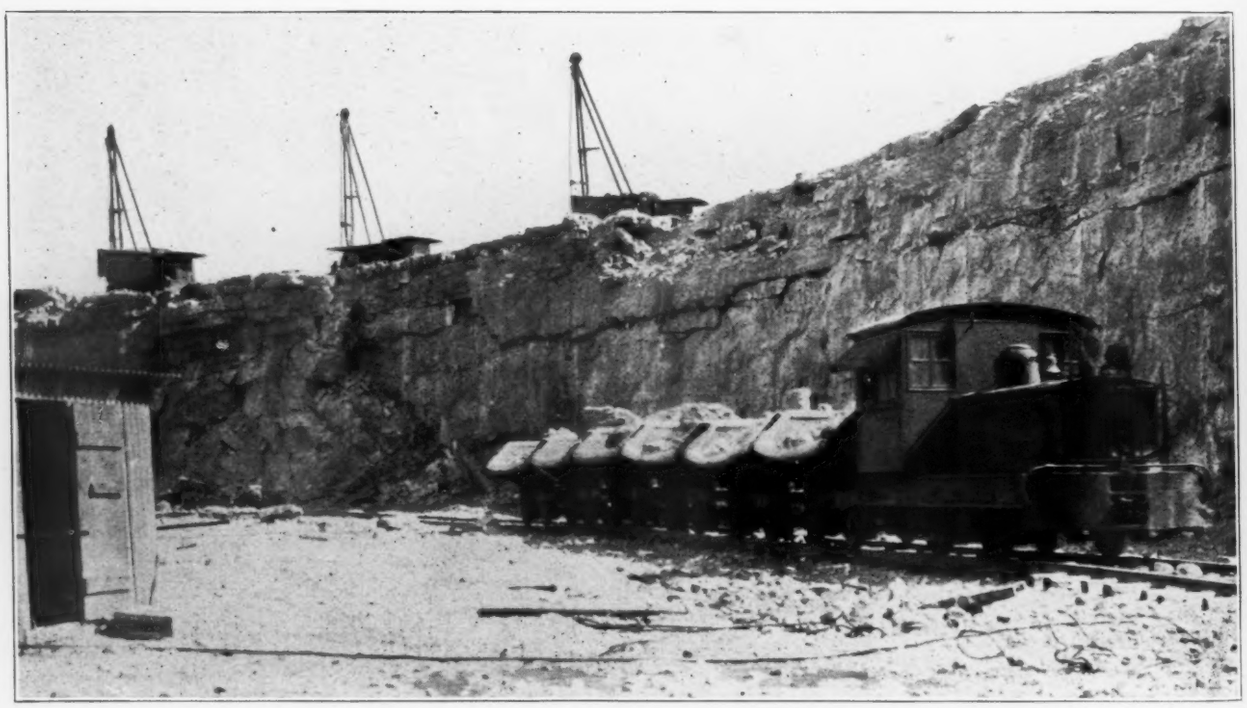
iron, concrete, with corrugated, galvanized iron siding and roofing.

One large Model 92 Marion electric caterpillar shovel, equipped with a 3½-yd. dipper, and one Model 37 with a revolving 2-yd. dipper are used to excavate the stone, while a Marion 32 is used for stocking and other work on top. The shovels load into two trains, each consisting of an 18-ton Plymouth gasoline locomotive and six 8-yd. Atlas all-steel, heavy duty cars, operating on a standard gauge track. The stone is hauled to 2, represented in the diagram, and dumped by a Curtis air hoist onto a Traylor apron feeder and delivered to a 60-in. by 80-in. Traylor primary jaw crusher that has a capacity of 5,000 tons each 10-hr. day. The crushing jaw measures 7 feet in width by 18 feet in height and is operated by a 350-hp. motor. The driving unit that gives the jaw its momentum consists of a large shaft, a 16-ft. driving pulley with a



View of the Primary Crusher Building

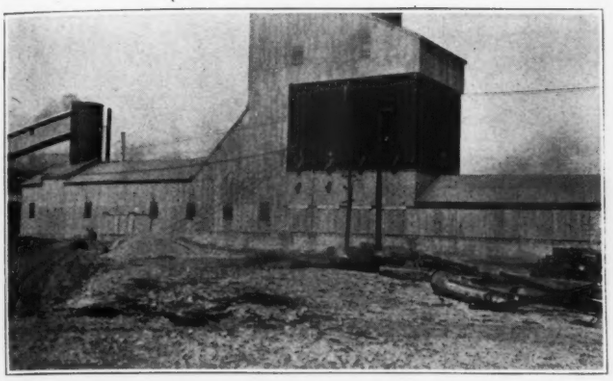
30-in. face and a 12-ft. flywheel. The crushed limestone is taken by a 48-in. by 130-ft. center Link-Belt pan conveyor driven by a 100-hp. motor, backgeared to a Link-Belt silent chain drive to another building, where the scalping screen is located at 3 in the diagram. The stone is discharged on a bar grizzly which acts as a feeder to the Robins cataract grizzly, or screen with manganese rolls.



A Loaded Train Shown in Front, With Three Clipper Drills in Rear of Picture

At this point, 3 on the diagram, kiln stone, sizes from 5 to 9-inch, is separated from the fines—from 5-inch to dust—each going to its respective storage bin from which the daily demand is withdrawn, rescreened and delivered to 2-yd. gable-bottom dump cars for kiln stone and moved by a Lidgerwood electric hoist and cabled up the steel incline to the top of the kilns; or on a 30-in. Robins belt conveyor for fines.

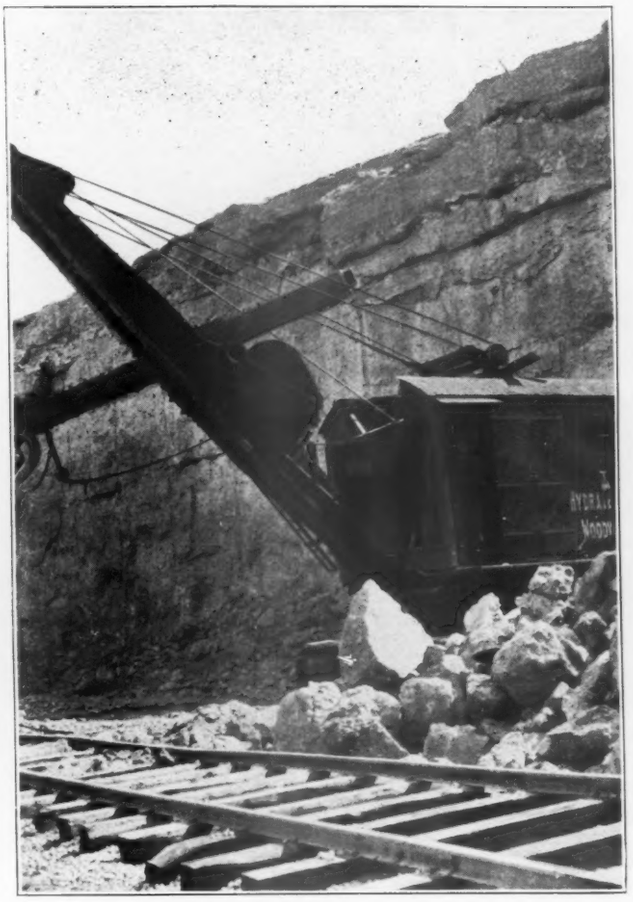
At 4, in the diagram, are located three batteries



A Part of the Stone Drying and Pulverizing Plant, Erected in 1928

of 12 Arnold 12-ft. 6-in. coal-fired kilns for calcining the limestone, recently installed by Arnold and Weigel, which makes a total of 36 kilns. The total output is 600 tons of hydrated finishing lime per day. All kilns are equipped with McGinty shaking grates, beneath which steam is supplied for moisture and induced draft.

The kilns are fired day and night for a period of eight to twelve months during the year, depending on the life of the firebrick lining. The furnaces are charged every thirty minutes and the lime is drawn from the kilns every four hours.



View of the Quarry Face and a Part of the Electric Revolving Shovel

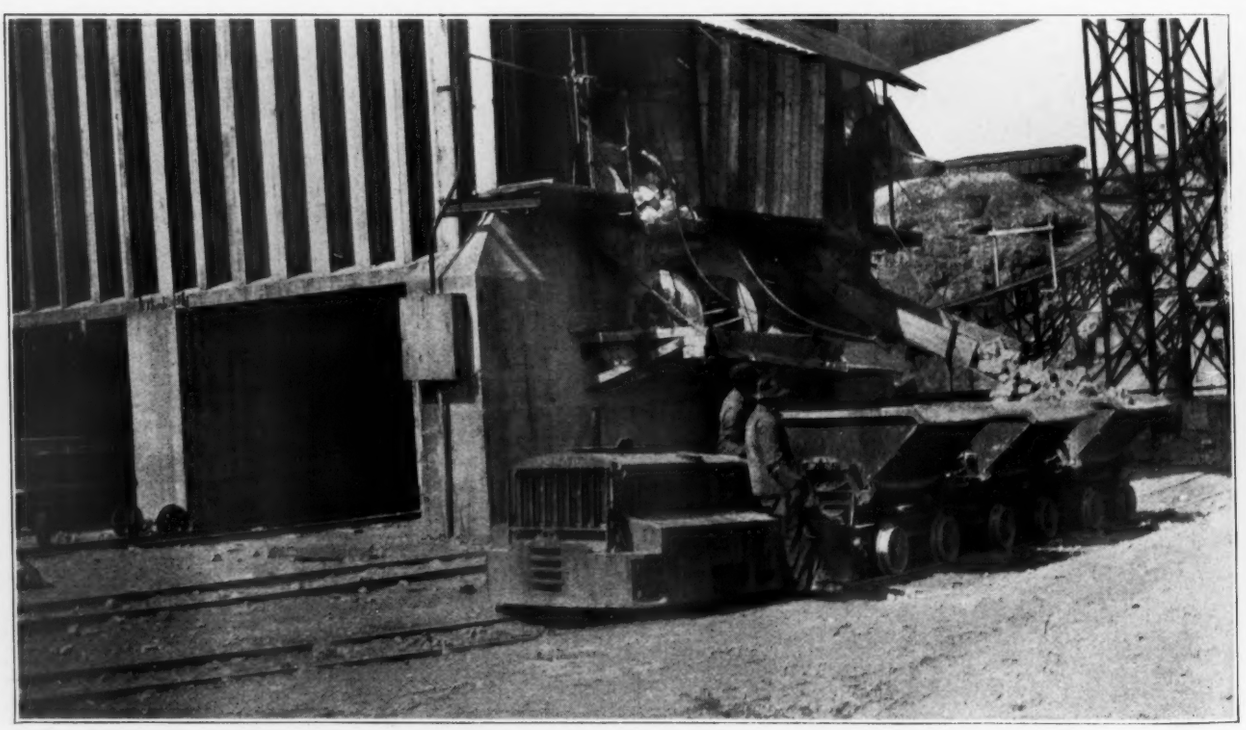
Train of Loaded Cars Approaching the Primary Crusher

Loading Shed So Arranged as to Give Service in All Kinds of Weather

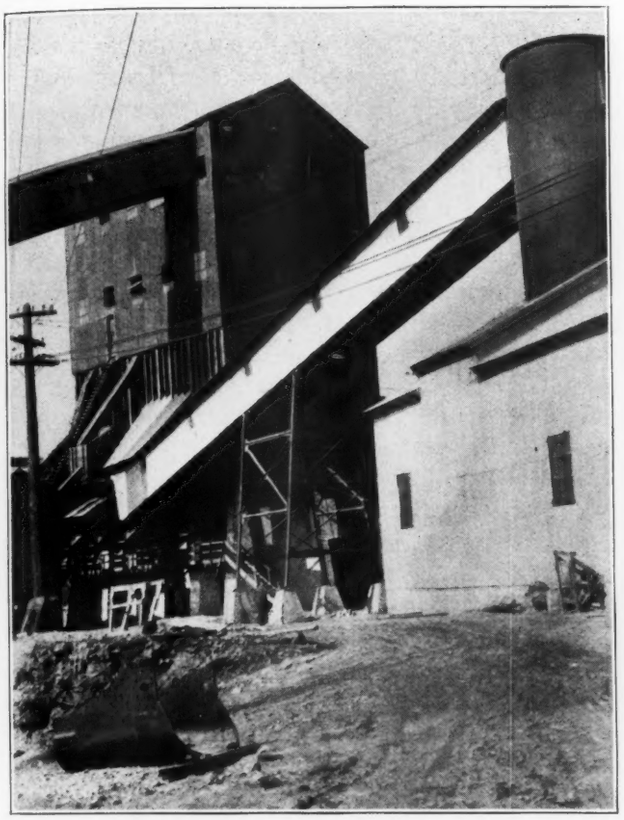
The fires are cleaned every 24 hours and the stone dust is burned on opposite sides of the shaft through which the stone passes. The gases from the coal are mixed with steam and drawn up into the heated stone, where they drive off or free the carbon dioxide. This method of burning results in a pure white lime free from all ashes and free from all taint of coal smoke.

At each drawing period, the lime is drawn from the kilns into Easton gable-bottom steel cars by pneumatically operated draw shears. The cars are hauled by a Plymouth gasoline locomotive over the scales to obtain the correct weight of the lime produced by each kiln. The lime is then hoisted up the incline and dumped into the five-compartment cooling bin of 500-ton capacity, at 5 in the diagram. This permits of the lime to be cooled in four of the compartments while drawing the fifth. From the bins is drawn the product for ground and hydrated lime. The portion intended to be used

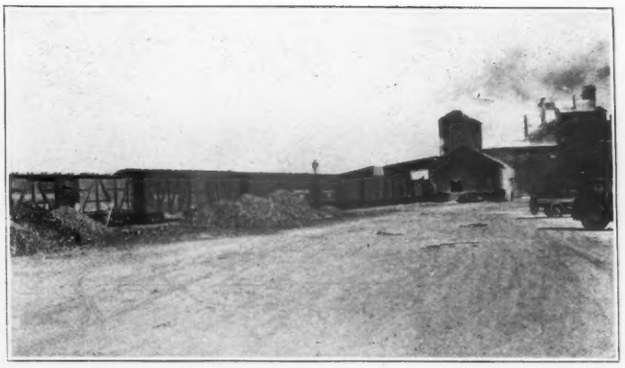
Side of Commercial Stone Plant and Arrangement for Loading Trucks



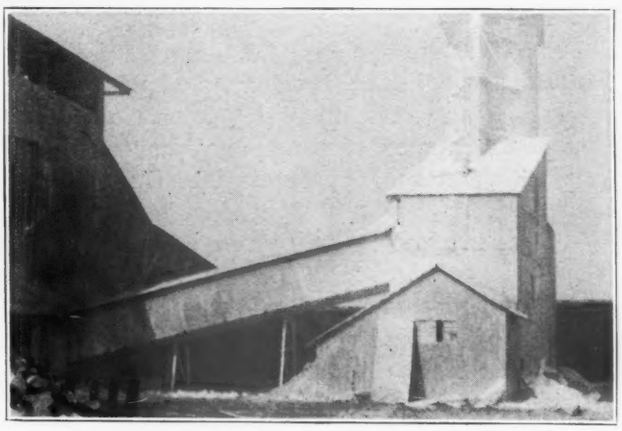
Stone Being Drawn From the Side of the Kiln Stone Bins. A Small Locomotive and Reaver Grizzly that Operates by Gravity and Is Used for Rescreening Kiln Stone Are Shown



The Commercial Stone Screening Plant and a Part of the Stone Drying Plant



String of Loaded Cars. All Cars Are Handled by Gravity



View of Ground Lime Plant

for ground lime is taken by a conveyor to the plant, at 6 on the diagram, where the lump is ground to serve the various size demands of the trade.

That which is to be hydrated is hand-picked to eliminate all inferior material, and then conveyed to 7 on the diagram, where it is ground into the proper sizes for hydrating by a Williams hammer mill and then conveyed to another large storage bin.

A Part of the Coal Trestle Which Provides Storage for Ap proximately 2,500 Tons of Coal. In the Background Are Twelve Kilns

Part of the Yard Below the Crusher With Loaded Cars

From this storage bin, the pulverized lime is handled by Schaeffer poidometers, which accurately and automatically weigh a previously predetermined amount of water and lime. It is discharged from the poidometers into the Schaeffer continuous hydrators, at 8 on the diagram, entering at the top and passing through eight levels in the process of hydration. It is next passed to four Bonnot finishing mills and elevated to the respective bins, finishing lime, superfine hydrated lime and general purpose lime.

It is then withdrawn as required to a battery of four Bates valve packers, at 9 on the diagram, with a capacity of 24 bags per minute. Before loading, all cars are carefully inspected, cleaned and repaired to insure the protection of the product from exposure in transit. Corrugated boxboard is used for lining the cars to keep the bags clean and free from any foreign matter that may be between the linings of the car. Only competent American workmen are employed, with an experienced foreman in charge of the loading.

Empty sacks are brought to the plant in trucks or cars and stored at 10 in the diagram. From storage, they are withdrawn at 9 on the diagram as required.

Commercial Stone Plant

The commercial stone, 5-in. to dust, which passes through the Robins grizzly, at 3 on the diagram, is sized and deposited in a 2,500-ton capacity storage bin. There is also a re-crushing unit, at 12 on the diagram, to provide for special sizes or as a booster in case of a heavy demand for commercial sizes. This includes a 7½-Austin crusher and a 36-in. Symons disc crusher.

The size from ⅜-in. and finer passes from 11 on the diagram to a Robins belt conveyor and is taken to the top of the stone drying plant, at 13 on the diagram, which has a capacity of 30 tons per hour.

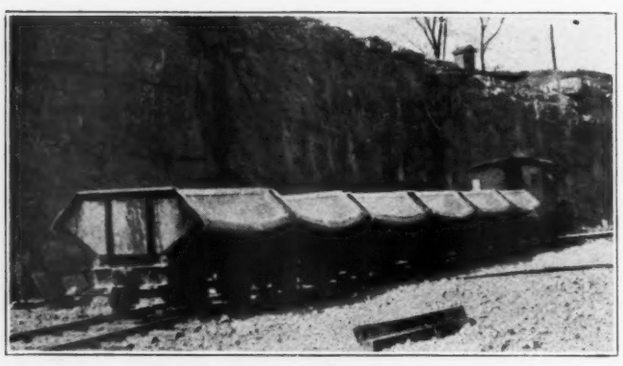
The engineering work on this plant was done by Arnold and Weigel, the erection by the Bellefontaine Bridge and Steel Company, and the 60-ft. return dryer was furnished by the Louisville Drying Machinery Company.

At the top of this plant, the material falls from the belt conveyor onto another Robins rotary grizzly with five 8-in. rolls, and from it to a Robins broncho shaking screen. Then follow four hummer vibrating screens in series, one of them a double surface screen, making two separations. Ten sizes of commercial stone are made and sold for a variety of uses, including the chemical trades, concrete products, agricultural stone, highway, general contract work, steel fluxing and many minor uses as required.

Digging a Foundation for an Elevator to Provide Additional Material to Run the Stone Drying and Pulverizing Plant

The bins, at 13 on the diagram, are of all-steel construction, having a capacity of 30 cars. Four loading tracks lead to these bins and, in addition, there is a truck road that does not interfere with the railroad car-loading tracks.

The daily capacity of the plant is: Lump lime, 540 tons; hydrated lime, 600 tons; commercial stone, 2,000 tons; and dried stone, 300 tons. This capacity enables the Ohio Hydrate and Supply Company to ship over 95 per cent of the orders the day they are received. Each order is handled by an executive and each shipment is checked by the



A Train of Standard Gauge Cars and Locomotive. Two Trains Are Used in the Quarry

View of the Three Inclines, One Over a Kiln Stone Storage Bin and the Other Two Extending to Two Batteries of Kilns

Traffic Department to insure the lowest possible rate and the most expeditious route. This Department constantly checks the time consumed in transit to speed up the service, observes changes in railroad rates and makes every effort to give each customer the required prompt and efficient service.

The personnel of the company is an unchanging one, which is always indicative of a progressive and growing business. Fred Witmer is president; F. L. Mauntler, vice-president; E. H. Mauntler, secretary-treasurer; Otis Bittinger, general manager; J. R. Reaver, superintendent; and R. L. Hardy, chemist. The engineering and contracting firm of Arnold and Weigel has been identified with the growth and progress of this company.

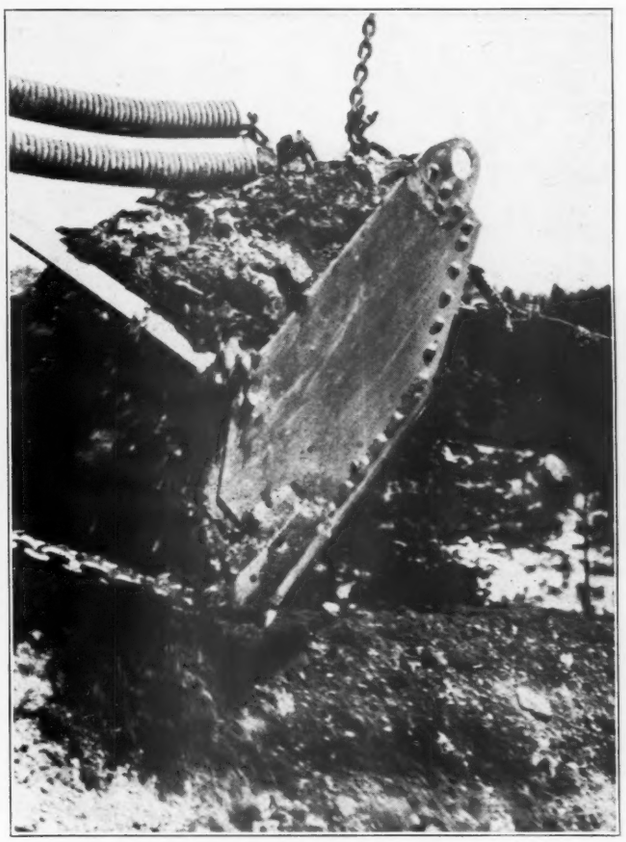
New Volume of Road Builders Proceedings Is Being Distributed

The proceedings of the 26th annual convention of the American Road Builders Association which was held January 14 to 19, 1929 at Cleveland, Ohio, appears in a splendid volume of nearly six hundred pages, with flexible binding. This will serve as an excellent book of reference for every man who is connected, in any capacity, with the construction or maintenance of highways.

Kaolin Plant in Georgia

(*Continued from Page 76*)

John M. Walker is president of the company and J. E. Jones is superintendent. Mr. Walker is one of the pioneers of the kaolin industry in Georgia. He has been in this field for almost 50 years, a large part of the time in Delaware and Pennsylvania when the industry was flourishing there.



Dumping the Scraper Bucket

Features Will Be Broadcast In Universal Safety Series

The following addresses, sponsored by the National Safety Council, are announced for nationwide broadcasting on succeeding Saturday afternoons at 5:15, central standard time:

May 25—Dr. John H. Finley, editor of the New York Times: "Education—The Part It Plays in Safety."

June 1—Dr. Miller McClintock, director, Albert Russell Erskine Bureau of Street and Highway Research, Harvard University, "Making Our Highways Safe."

June 8—Grover A. Whalen, New York Commissioner of Police: "Enforcement as an Aid to Safety."

June 15—Alfred H. Swayne, vice-president, General Motors: "The Automobile and Safety."

June 22—Harry F. Guggenheim, of the Daniel Guggenheim Fund for the Promotion of Aeronautics: "Safety in the Air."

Distribution of Cement

Portland cement shipped from mills into States in February and March, 1928 and 1929, in barrels

The following figures show shipments from Portland cement mills distributed among the States to which cement was shipped during February and March, 1928 and 1929.

Shipped to—	February		March	
	1928	1929	1928	1929
Alabama	254,968	105,162	282,379	127,916
Alaska	928	0	264	525
Arizona	72,365	58,844	81,586	57,406
Arkansas	76,288	40,599	101,428	93,133
California	909,617	900,811	937,253	1,063,895
Colorado	33,593	25,474	60,381	59,854
Connecticut	52,401	54,574	113,752	106,492
Delaware	11,304	14,459	19,230	19,112
District of Columbia	55,069	58,207	62,160	86,492
Florida	105,590	92,217	114,798	100,388
Georgia	97,616	73,064	157,171	95,061
Hawaii	26,923	20,683	39,411	22,366
Idaho	11,020	3,792	23,994	20,842
Illinois	401,092	251,883	700,881	612,069
Indiana	102,747	87,506	232,338	251,934
Iowa	41,520	21,406	149,705	123,637
Kansas	107,291	56,678	194,957	217,559
Kentucky	52,748	32,328	103,113	102,241
Louisiana	97,484	81,109	115,669	104,285
Maine	10,738	15,199	18,704	19,229
Maryland	66,413	59,087	123,334	131,729
Massachusetts	100,548	79,633	160,730	165,380
Michigan	287,114	273,538	433,110	474,902
Minnesota	49,334	44,013	128,332	136,193
Mississippi	50,677	50,254	73,937	75,353
Missouri	170,275	109,614	333,221	342,697
Montana	10,578	5,570	27,231	20,068
Nebraska	33,967	15,409	88,491	88,438
Nevada	4,524	6,905	7,568	9,755
New Hampshire	18,066	17,091	25,575	32,824
New Jersey	296,641	247,004	505,016	485,067
New Mexico	21,302	16,549	30,606	25,796
New York	768,681	667,767	1,237,218	1,285,742
North Carolina	100,830	85,373	209,006	159,570
North Dakota	2,641	2,502	18,274	16,912
Ohio	298,885	253,420	540,347	564,820
Oklahoma	203,245	112,301	294,206	318,321
Oregon	74,793	34,873	78,121	81,126
Pennsylvania	404,956	373,929	657,006	715,616
Porto Rico	0	3,745	1,329	420
Rhode Island	18,701	25,497	47,707	43,300
South Carolina	75,677	74,035	119,612	100,091
South Dakota	10,434	4,361	25,694	32,110
Tennessee	109,112	80,026	174,774	140,815
Texas	383,884	424,778	546,960	621,387
Utah	15,131	11,850	35,955	28,712
Vermont	15,902	14,066	14,737	24,984
Virginia	104,674	83,678	173,697	138,772
Washington	128,568	68,792	162,335	213,399
West Virginia	44,944	35,675	81,273	70,720
Wisconsin	91,829	74,696	148,969	197,738
Wyoming	8,427	3,818	13,571	7,672
Unspecified	22,737	47,710	57,761	28,918
	6,514,792	5,401,554	10,084,877	10,063,783
Foreign Countries	48,208	46,446	50,123	49,217
Total shipped from cement plants	6,563,000	5,448,000	10,135,000	10,113,000

Production, shipments, and stocks of finished Portland cement, by months, in 1928 and 1929 (In thousands of barrels)

Month	Production		Shipments		Stocks at end of month	
	1928	1929	1928	1929	1928	1929
January	9,768	9,881	6,541	5,707	25,116	26,797
February	8,797	8,522	6,563	5,448	27,349	29,870
March	10,223	9,969	10,135	10,113	27,445	a29,724
April	13,468	13,639	13,307	13,319	27,627	30,044
May	17,308	.....	18,986	.....	25,984	.....
June	17,497	.....	18,421	.....	25,029	.....
July	17,474	.....	19,901	.....	22,580	.....
August	18,759	.....	21,970	.....	19,374	.....
September	17,884	.....	20,460	.....	16,799	.....
October	17,533	.....	19,836	.....	14,579	.....
November	15,068	.....	11,951	.....	17,769	.....
December	12,189	.....	7,384	.....	22,650	.....
	175,968	.....	175,455	.....	.....	.....

Production and stocks of clinker, by months, in 1928 and 1929 (In thousands of barrels)

Month	Production		Stock end of month	
	1928	1929	1928	1929
January	11,839	12,041	9,672	9,642
February	11,363	11,255	12,237	12,436
March	12,501	a12,450	14,463	a14,948
April	13,844	14,012	15,002	15,431
May	16,025	.....	14,329	.....
June	15,940	.....	12,944	.....
July	15,981	.....	11,707	.....
August	16,202	.....	9,357	.....
September	15,909	.....	7,566	.....
October	15,782	.....	5,944	.....
November	14,930	.....	5,953	.....
December	13,426	.....	7,422	.....

a Revised.

Cement Statistics For April 1929

The Portland cement industry in April, 1929, produced 13,639,000 barrels, shipped 13,319,000 barrels from the mills, and had in stock at the end of the month 30,044,000 barrels, according to the United States Bureau of Mines, Department of Commerce. The production of Portland cement in April, 1929, showed an increase of 1.3 per cent and shipments an increase of 0.1 per cent, as compared with April, 1928. Portland cement stocks at the mills were 8.7 per cent higher than a year ago.

The statistics here presented are compiled from reports for April, from all manufacturing plants except two for which estimates have been included in lieu of actual returns.

In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 159 plants at the close of April, 1929, and of 156 plants at the close of April, 1928. In addition to the capacity of the new plants which began operating during the twelve months ended April 30, 1929, the estimates include increased capacity due to extensions and improvements at old plants during the period.

New Corporations

Columbia Cement Co., 1686 W. Adams St., Los Angeles, Calif. 300,000 shares. Fred A. Ballin, Pres., Los Angeles; Arthur Langguth, Sec., Portland, Ore.; J. L. Jennings and E. H. Collis, directors.

Angelus White Portland Cement Co., Douglas B. Palmer, Pres., 7 Mesquite Bldg., Las Vegas, Nev. 35,000 shares. Claude B. Andrews, 803 Hillstreet Bldg., Los Angeles, Calif.; Edward Duryee, Frank H. Read, Wm. Wilson, Harry E. Mull; John C. Gillham, attorney, 803 Hillstreet Bldg., Los Angeles.

Kesler Marl & Lime Co., Hillsboro, Ohio. $400,000. L. C. Kesler, J. S. Kesler, John West.

Badgerock Pavement Co., Milwaukee, Wis. Chas. H. Olroge, 957 47th St. To operate a quarry.

Standard Sand & Gravel Corp., c/o Brower, Brower & Brower, 26 Court St., Brooklyn, N. Y. $20,000.

Hillside Washed Sand & Gravel Co., Milwaukee, Wis. Carl J. Reuter, 1905 12th St.; A. J. Schmitz, 1013 Summit Ave.; F. R. Ives, 1019 Cramer St.

Altair Sand & Gravel Co., R. A. Griffin, 537 Granburg St., Houston, Tex. $30,000. J. E. Boyd, W. P. Callaway.

Duck Creek Stone Co., Green Bay, Wis. 250 shares com., $100 each. H. Beemster, W. Sheedy, C. G. Chadek.

Kramp Constr. Co., Inc., Berlin, Wis. August J. Kramp, Thos. J. Curran, Louis B. Krause. To operate quarry.

Wisconsin Shale Products Co., Fond du Lac, Wis. $25,000. Wells K. Gregg, Richard H. Tyrell. Crushed stone.

Consolidated Mica Co., Spruce Pine, N. C. $100,000. W. E. Richardson, Erwin, Tenn.; John V. Cox and James A. Mayberry, Spruce Pine, N. C.

International Diatomite Industries, Ltd., Montreal, Que., Can. 110,000 shares n.p.v.

Car-Bar Minerals Corp., Fidelity Bldg., Baltimore, Md. 150 shares n.p.v. E. Paul Mason, Robt. J. MacGregor, R. Wright MacGregor. To develop feldspar and soapstone deposits.

McKenzie Quartzite Development Co., Ltd., Box 579, Edmonton, Alta., Can. 2,000,000 shares n.p.v.

Regal Fluorspar Co., c/o Corp. Trust Co. of Amer., Dover, Del. 3,000 shares.

Dayton Limestone Quarry Co., Dayton, O. 250 shares n.p.v. Chas. R. Short, Virgil Schaeffer, Attilio Angelo.

Dundee Limestone Co., c/o Colonial Charter Co., Wilmington, Del. $200,000.

Silica Sand Co., R. F. D. 4, Knoxville, Tenn. $75,000. H. A. Johnson, W. C. Anderson, C. A. Scheibel.

Shore Sand & Gravel Co., Walter Taylor, Asbury Park, N. J. $100,000.

John Wright & Co., Inc., Stone Harbor, N. J. $20,000.

Home Insulation Co., G. B. J. Gerety, White Plains, N. Y. $100,000. To mine asbestos.

Apex Quartz Co., St. Clair, Mo. $50,000. John W. Steinbeck, J. W. Jenny, Union, Mo.; O. L. Gard, St. Clair, Mo. To mine, mill, and pulverize rock and shale.

Nardone-Ciferri, Millbrook, N. Y. $25,000. Sand and gravel.

Alaska Asbestos, Inc., c/o Corp. Trust Co. of Amer., Wilmington, Del. 4000 shares com.

Texas Construction Material Co., Beaumont, Tex. $600,000 Merger of Gemmer & Tanner, Inc., and Beaumont Building Material Co.

South Carolina Gravel Co., Columbia, S. C. 2500 shares pfd., n. p. v. B. F. Johnson, Pres.; Chas. H. Gerald, Sec.-Treas.

Center Sand & Gravel Co., Omaha, Nebr. $10,000. A. E. Roberts, E. H. Tiffany, H. J. Landeman, and C. E. Moffit.

Exports and Imports

Exports of hydraulic cement by countries in March, 1929

Compiled from the records of the Bureau of Foreign and Domestic Commerce and subject to revision.

Exported to—	Barrels	Value
Canada	2,131	$11,468
Central America	19,933	52,178
Cuba	6,147	18,797
Other West Indies and Bermuda	8,051	19,021
Mexico	3,325	11,032
South America	24,151	88,390
Other Countries	5,341	34,278
	69,079	$235,164

Imports of hydraulic cement by countries and by districts, in March, 1929

Imported from—	District into which imported	Barrels	Value
Belgium	Los Angeles	73,500	$39,839
	Massachusetts	2,043	2,545
	Porto Rico	1,600	2,796
	South Carolina	14,165	17,100
	Total	91,308	62,280
Canada	Maine and New Hampshire	175	400
Denmark	New York	9,022	9,497
	Porto Rico	21,000	26,670
	Total	30,022	36,167
France	New York	30	172
	San Francisco	9	27
	Total	39	199
Sweden	New York	88	517
	San Francisco	51	56
	Total	139	573
United Kingdom	New York	8,723	11,653
	Philadelphia	1,503	1,516
	Total	10,226	13,169
	Grand total	131,909	$112,788

Exports and imports of hydraulic cement, by months, in 1928 and 1929

Month	Exports				Imports			
	1928		1929		1928		1929	
	Barrels	Value	Barrels	Value	Barrels	Value	Barrels	Value
January	56,400	$204,875	78,639	$283,002	234,753	$342,797	151,302	$177,976
February	62,828	221,620	58,886	225,590	164,408	217,525	118,930	123,123
March	74,983	265,719	69,079	235,164	235,930	330,074	131,909	112,788
April	61,676	205,882	.....	.....	249,458	324,371	.....	.....
May	70,173	236,005	.....	.....	190,509	256,872	.....	.....
June	59,536	201,313	.....	.....	266,537	359,637	.....	.....
July	83,759	291,055	.....	.....	112,887	151,877	.....	.....
August	88,736	302,866	.....	.....	259,988	358,858	.....	.....
September	71,995	252,843	.....	.....	173,439	226,295	.....	.....
October	62,137	246,010	.....	.....	152,210	226,909	.....	.....
November	69,313	260,310	.....	.....	67,240	92,468	.....	.....
December	63,120	250,204	.....	.....	175,992	233,300	.....	.....
	824,656	$2,938,702	.....	.....	$2,283,351	$3,120,983	.....	.....

Domestic hydraulic cement shipped to Alaska, Hawaii, and Porto Rico, in March, 1929

	Barrels	Value
Alaska	157	$ 513
Hawaii	25,974	56,779
Porto Rico	554	2,421
	26,685	$59,713

Production, shipments, and stocks of finished Portland cement, by districts, in April, 1928 and 1929, and stocks in March, 1929 (In thousands of barrels)

District	April						Stocks at end of March 1929a
	Production		Shipments		Stocks at end of month		
	1928	1929	1928	1929	1928	1929	
Eastern Pa., N. J. and Md	3,084	3,005	3,303	3,165	6,488	6,781	6,941
New York and Maine	831	900	850	732	1,847	2,242	2,073
Ohio, Western Pa., and W. Va	1,321	1,401	1,154	1,274	3,577	3,777	3,650
Michigan	1,056	964	846	897	2,467	2,658	2,591
Wis., Ill., Ind. and Ky	1,438	1,903	1,670	1,608	3,429	4,343	4,049
Va., Tenn., Ala., Ga., Fla. and La	1,381	1,117	1,276	1,251	2,040	2,114	2,248
Eastern Mo., Iowa, Minn. and S. Dak	1,142	1,150	1,154	1,086	3,901	4,362	4,297
Western Mo., Neb., Kan. and Okla	906	932	803	1,034	1,566	1,395	1,497
Texas	557	622	538	625	468	443	446
Colo., Mont. and Utah	200	217	217	259	465	409	451
California	1,254	1,085	1,184	1,058	929	920	894
Ore. and Wash	298	343	312	330	450	600	587
	13,468	13,639	13,307	13,319	27,627	30,044	29,724

Relation of Production to Capacity

	April		March	February	January
	1929	1928	1929	1929	1929
	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
The month	67.1	70.0	47.4	44.8	46.5
The 12 months ended	71.1	74.0	70.9	71.0	71.0

Ingenious Scheme for Replacing Transformers

EVERY industrial engineer knows what it means when an emergency arises, and probably nothing taxes a man's ability more at times than to keep his head and do it successfully. During the floods of November, 1927 in Vermont, many painful lessons of this kind were learned. So, when the 44,000-volt transformers on the transmission line of the Vermont Marble Company, which serves its plant at Danby, Vermont, burned out last summer it seemed almost like old times. And as before, the company's electrical department rose to the situation.

To understand how this was accomplished, it must first be explained that the marble company's various quarries and mills are connected electrically by its own line, a 44,000-volt circuit between the West Rutland sub-station and Danby, a distance of 21 miles. At the latter point, the current is stepped down, by other transformer banks, to 220 volts for distribution to the motors in each of the three quarries. The three 44,000-volt transformers were burned out, there were no spares available, and ten-weeks' delivery for new ones was the best that could be promised. This meant shutting down the operations of these quarries for three months and holding up several rush orders.

It was found that two 44,000-volt transformers, of 333-kva. and 250-kva. capacity respectively, could be borrowed from the Vermont Hydroelectric Corporation for a temporary connection. But there was another difficulty. The burned-out 44,000-volt transformers were near the upper end of an inclined railway, one mile up the side of the mountain where the quarries are located at an elevation of 900 feet above the valley traversed by the Rutland Railroad. This incline is operated by a cable and motor-driven hoist and is used to let blocks of marble down from the quarry to the railroad, as described in the May 8 issue of PIT AND QUARRY. The problem was how to get the borrowed transformers up to their location when there was no power to run the hoist. They could have been trucked part way up the mountain but not nearer than half a mile from their desired location. They would have to be taken the rest of the way by means of block and tackle and the ground is so steep and rough that the risk of disaster made it impracticable. It would have been very slow and expensive at best, even if accidents could be avoided.

The electrical department devised a much better plan. It was possible to obtain 3300-volt current at the West Rutland and of the 44,000-volt line and to send it to Danby, which, as already stated, is 21 miles away. This was done. The burned-out transformers were cut out and the voltage drop over this length of line was such that the 2200-220 volt transformer bank could hold it when the 75-hp. motor driving the inclined railway hoist was in operation. It was thus a simple matter to transport the borrowed transformers by truck to the foot of the incline and then to haul them up the mountain on cable cars to within ten feet of their place of installation. In this way, the quarries resumed operation within three days after the burnout.

Of course, considerable risk of damage to the 2200-220 volt transformers was incurred, but it was worth while. Even if these three 50-kva. transformers had been ruined as a result of this procedure, they served only a part of the operations at this point and others were on hand to replace

(*Continued on Page* 88)

The Dandy Cable Road up Which the Transformers Were Hauled

The Fluorspar Industry in 1928

Noteworthy features in the fluorspar industry in 1928 were the substantially increased domestic shipments—the largest since 1922; the decreased imports (chiefly from Germany and the United Kingdom)—the smallest since 1923; the resumption of fluorspar mining in Nevada; the greatly increased domestic production of acid-grade fluorspar—the largest since 1920 and more than four times that in 1927; and the increase, effective November 16, 1928, in the rate of duty on fluorspar, containing not more than 93 per cent of calcium fluoride, from $5 a short ton to $7.50 a short ton, according to a statement prepared by Hubert W. Davis, of the United States Bureau of Mines, Department of Commerce.

The figures on production of fluorspar in Illinois were collected in cooperation with the State Geological Survey.

Shipments from Mines

The fluorspar shipped from mines in the United States in 1928 amounted to approximately 140,631 short tons and was valued at approximately $2,658,549, as compared with 112,546 tons, valued at $2,034,728, in 1927. Thus there were increases of 25 per cent in quantity and of 31 per cent in total value as compared with 1927. Fluorspar was shipped from Colorado, Illinois, Kentucky, Nevada, and New Mexico in 1928, but Colorado and New Mexico were the only States to record decreases.

The reported shipments of fluorspar for use in the manufacture of steel, glass, enamel and vitrolite, and hydrofluoric acid were more than in 1927, but the shipments to foundries were less, and the quantity exported was about the same as in 1927.

The general average value i.e. selling prices per ton f.o.b. shipping points for all grades of fluorspar in 1928 was $18.90, which is 82 cents more than the average for 1927. The increase in the general average value for 1928 is due to the larger production and higher selling price of acid-grade fluorspar. The general average value of the fluorspar shipped to steel plants in 1928 from the Illinois-Kentucky district was $15.27 a ton and from the Colorado-New Mexico district $12.19 a ton. These values compare with $16.59 for the Illinois-Kentucky district and $13.72 for the Colorado-New Mexico district in 1927. This difference in average values represents chiefly economic factors in marketing rather than differences in quality of fluorspar from these two districts.

The following tables show the details of the shipments of fluorspar by States, by kinds, and by uses for 1927 and 1928.

Fluorspar shipped from mines in the United States. 1927-1928, by States

State	1927 Short tons	1927 Value Total	1927 Value Average	1928 Short tons	1928 Value Total	1928 Value Average
Illinois	46,006	$863,909	$18.78	65,884	$1,154,983	$17.53
Kentucky	57,495	1,040,338	18.09	69,747	1,426,766	20.46
Colorado	6,432					
New Mexico	2,613	130,481	14.43	5,000*	76,800*	15.36*
Nevada	.....	.....	.....			
	112,546	2,034,728	18.08	140,631*	2,658,549*	18.90*

*Approximate and subject to slight revision.

Fluorspar shipped from mines in the United States. 1927-1928, by kinds

Kind	1927 Short tons	1927 Value Total	1927 Value Average	1928 Short tons	1928 Value Total	1928 Value Average
Gravel	97,036	$1,599,310	$16.48	122,202	$2,129,329	$17.42
Lump	4,960	105,062	21.18	6,146	160,803	26.16
Ground	10,500	330,356	31.31	12,283	368,417	29.99
	112,546	2,034,728	18.08	140,631	2,658,549	18.90

Fluorspar shipped from mines in the United States 1927-1928, by uses

Use	1927 Short tons	1927 Value Total	1927 Value Average	1928 Short tons	1928 Value Total	1928 Value Average
Steel	93,196	$1,523,915	$16.35	108,205	$1,643,185	$15.19
Foundry	4,533	84,724	18.69	3,694	66,215	17.93
Glass	5,968	184,450	30.91	6,499	195,885	30.14
Enamel and vitrolite	3,813	119,888	31.44	4,713	142,495	30.23
Hydrofluoric and derivatives	3,748	98,364	26.24	15,946	585,092	36.69
Miscellaneous	903	15,880	17.59	1,176	19,091	16.23
Exported	385	7,507	19.50	398	6,586	16.55
	112,546	2,034,728	18.08	140,631	2,658,549	18.90

Stocks at Mines

According to the reports of producers the stocks of fluorspar at mines or at shipping points on December 31, 1928, amounted to 10,433 short tons of gravel fluorspar, 999 tons of lump fluorspar, and 714 tons of ground fluorspar, a total of 12,146 tons of "ready-to-ship" fluorspar. In addition there was in stock-piles at mines at the close of 1928 about 60,500 short tons of crude (run-of-mine) fluorspar which must be milled before it can be marketed and which is calculated to be equivalent to about 35,000 tons of merchantable fluorspar. These stocks compare with 23,402 tons of "ready-to-ship" fluorspar and 49,231 tons of crude fluorspar on December 31, 1927. Thus the stocks of merchantable fluorspar decreased about 48 per cent but the stocks of crude fluorspar increased about 23 per cent as compared with 1927.

Imports Into the U. S.

The total imports of fluorspar into the United States in 1928, amounting to 47,183 short tons, represent a decrease of 34 per cent from 1927, and are the smallest since 1923. The imports in 1928 are equivalent to 34 per cent of the total shipments of domestic fluorspar, as compared with 64 per cent in 1927.

The United Kingdom, which from 1922 to 1926 has been the chief source of the imported fluorspar, supplied only 20 per cent of the total in 1928, the imports of 9,360 tons therefrom representing a decrease of 49 per cent. As in 1927, Germany was the chief source of imports in 1928, supplying 37 per cent of the total. The imports from Germany in 1928, however, were 45 per cent less than in 1927. France was the second largest source of imported fluorspar in 1928, supplying 32 per cent of the total.

Fluorspar Consumed and Stocked at Consumers' Plants

The figures on consumption of fluorspar in 1927 and 1928 and stocks at consumers' plants at the close of each of these years, given in the fol-

Fluorspar consumed and in stock in the United States, 1927-1928, by industries, in short tons

Industry	1927 Consumption	1927 Stocks at consumers' plants December 31	1928 Consumption	1928 Stocks at consumers' plants December 31
Basic open-hearth steel	138,000	85,000	152,000	76,000
Electric-furnace steel	4,700	1,200	6,100	1,300
Foundry	3,400	1,000	3,300	1,000
Ferro-Alloys	500	100	800	400
Hydrofluoric acid and derivatives	15,500	13,000	20,500	11,000
Enamel and vitrolite	5,800	800	5,700	900
Glass	6,800	900	6,200	1,200
Miscellaneous	1,500	400	1,600	600
	176,200	102,400	196,200	92,400

lowing table, while not including data from all consumers, are believed to fall not far short of the total for the United States. Thus, the figures for the basic open-hearth steel industry, the chief consumer of fluorspar, include actual figures for the 70 companies that make 99.4 per cent of the total basic open-hearth steel and estimates for the other 2 companies. Consumption of all electric-steel and ferro-alloy manufacturers that are known to use fluorspar is accounted for. The smaller foundries, some of which use a little fluorspar, are not all represented, so that the figures for this industry are somewhat incomplete. The figures for fluorspar used in the manufacture of hydrofluoric acid represent actual figures for 5 companies and an estimate for 1 company. The consumption and stocks for the glass and enamel industries, although not covering all consumers, represent 112 companies. These companies include all of the larger and probably most of the smaller consumers, so that the figures for these two industries are believed to be practically complete.

Replacing Transformers

(Continued from Page 86)

them immediately. The time and risk involved in getting the temporary transformers into place in any other way was not warranted. The loss of production in the quarries would have been out of all proportion compared to the cost of replacing the three 50-kva. transformers. As a matter of fact, the 2200-volt transformers actually suffered no damage whatever.

Recent Patents

The following patents of interest to readers of PIT AND QUARRY recently were issued from the United States Patent Office. Copies thereof may be obtained from R. E. Burnham, patent and trade-mark attorney, Continental Trust Building, Washington, D. C., at the rate of 20c each. State number of patent and name of inventor when ordering.

1,708,947. Plaster-mixer. Gebhard Jaeger, Columbus, Ohio.

1,708,965. Machine for mixing road-making materials. Robert E. Bressler and Arno F. Hirschel, Aurora, Ill., assignors to Western Wheeled Scraper Co., same place.

1,709,082. Loading apparatus. Nils D. Levin, Columbus, Ohio, assignor to Jeffrey Mfg. Co., same place.

1,709,226. Process of calcining lime. Kissag M. Nahikian, Worcester, Mass., Robert W. Foster, Burlington, Vt., and Edgar T. Belding, New York, N. Y., assignors to Brewer & Co., Worcester, Mass.

1,709,418. Sheave construction for lever-arm buckets. William M. Venable, Pittsburgh, Pa., assignor to Blaw-Knox Co.

1,709,466. Ditcher-scoop assembly. Robert R. Downie, Beaver Falls Borough, Pa., assignor to Keystone Driller Co.

1,709,923. Road construction. Roy C. Taylor, Benton, Me.

1,710,052. Sand and rock separator. Julus Glowacki, South Boston, Mass.

1,710,280. Loading-skip-operating mechanism. George E. Webb, Milwaukee, Wis., assignor to Koehring Co., same place.

1,710,322. Crane. Leslie A. Russell, Milwaukee, Wis., assignor to Koehring Co., same place.

1,710,473. Bucket and bucket elevator and dredge. Frank H. Cothay, London, England.

1,710,477. Grading and loading apparatus. Edward P. Henry and Rolla A. Morton, Long Beach, Cal., assignors to Western Wheeled Scraper Co., Aurora, Ill.

1,710,564. Mechanical shovel. Frederick Archibald, Wilmington, Ill.

1,710,605. Conveyer-screen. Edward A. Bole, Long Beach, Cal.

1,710,659. Comminuting-mill. Elijah C. Greisen, Wauwatosa, Wis., assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis.

1,710,666. Comminuting-mill. Ray C. Newhouse, Milwaukee, Wis., assignor to Allis-Chalmers Mfg. Co., same place.

1,710,740. Hitch or clevis for dragline buckets. Rolf Ljungkull, Milwaukee, Wis., assignor to Harnischfeger Corporation, same place.

1,710,794. Automatic skip loader. Charles M. Young, Jr., Philadelphia, Pa., assignor to Link-Belt Co., Chicago, Ill.

1,710,765. Screen. Ray W. Arms, Chicago, Ill., asignor to Roberts & Schaefer Co., same place.

1,710,798. Unloading tower. Elwin H. Kidder, Chicago, Ill., assignor to Link-Belt Co., same place.

1,710,876. Water-tank for concrete-mixers. Gebhard Jaeger, Columbus, Ohio.

1,710,921. Light-weight concrete and process of making it. Roy Cross, Kansas City, Mo., and William A. Collins, Santa Monica, Cal., assignors to Silica Products Co., Los Angeles, Cal.

1,710,985. Excavating-bucket-forming machine. Arthur J. Jacobsen, Chicago, Ill., assignor to Monighan Mfg. Corp., same place.

1,711,044. Pulverizing apparatus. Fred H. Daniels, Worcester, Mass., assignor to Riley Stoker Corporation, same place.

1,711,063. Pulverizing-mill. Robert S. Riley, Worcester, Mass., assignor to Sanford Riley Stoker Co., same place.

1,711,405. Grinding-mill. David Cole, El Paso, Tex.

1,711,510. Skip-elevating mechanism. George E. Webb, Milwaukee, Wis., assignor to Koehring Co., same place.

1,711,896. Control mechanism for power shovels, hoists, cranes, and the like. Leland O. McLean, Pittsburgh, Pa.

1,711,964. Paddle for impact type of pulverizers. Walter W. Pettibone, Birmingham, Ala., assignor to Fuel Efficiency Engineering Corporation.

1,712,045. Bucket - positioning - indicating means for hoists. Ishmael W. Macy, Galion, Ohio, assignor to Galion Iron Works & Mfg. Co., same place.

1,712,369. Crushing-machine. Lloyd P. Walker, Belmont, Mass.

1,712,447. Adjustable support for loading skips. Charles F. Ball, Milwaukee, Wis., assignor to Chain Belt Co., same place.

The Cement Industry for April

The ratio of the operations to the capacity of the American portland cement industry during the month of April was 67.1 per cent, according to figures released by the Bureau of Mines of the Department of Commerce. During the month 13,639,000 barrels were produced, 13,319,000 barrels were shipped and there were in stocks on hand at the end of the month 30,044,000 barrels. Production in April, 1929 was 1.3 per cent more, and shipments 0.1 per cent more than in April, 1928. Stocks at the mills were 8.7 per cent higher than a year ago.

Boehck Machinery Company Appoints New Chief Engineer

Gordon F. Daggett, formerly executive secretary of the Wisconsin Mineral Aggregate Association, has become a member of the firm of Boehck Machinery Company, Incorporated, and holds the position of chief engineer. He is a graduate civil engineer with several years of experience in sand and gravel plant designing in addition to other experience of general engineering. He was with the Wisconsin Highway Commission for thirteen years, the last three of which he served as materials engineer.

*Figures compiled from records of the Bureau of Foreign and Domestic Commerce and those or 1928 subject to revision.

PIT AND QUARRY FOREIGN DIGEST

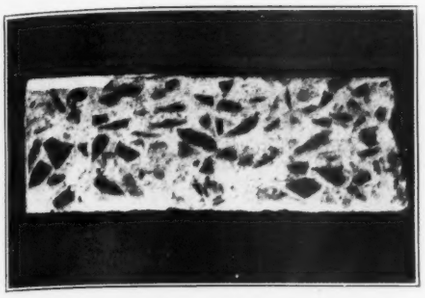


Fig. I. Section of Cast Concrete Slab

Tests for Cast Concrete Slabs

The properties of cast concrete slabs depend, naturally, upon the raw materials used—the kind of cement and aggregate, the grain size and composition, and the quantitative composition of the concrete mix, the ratio of cement, aggregate and water. The strength of a slab (Figure I) is tested for strength by the bending or flexile test machine shown in Figure II. The weight necessary to break the slab over the fulcrum is determined and the flexile strength calculated as follows:

where and

$$K = \frac{M}{1/6\ b.\ h^2}$$

M = the flexile moment.
b = length of the slab.
h = thickness of the slab.

$$M = \frac{P \times 1}{4}$$

P = breaking load.
1 = height of support.

Resistance to abrasion is tested by means of a sand blast. The characteristics of the slabs should meet the following specifications: (1) The flexile strength of a dry slab should not be less than 710 lbs. per sq. in. (2) The surface should resist a standard sand blast of 3 atmospheres pressure for two minutes to the extent of not losing more than 0.05 cubic inches per sq. in. (3) The dry slab should not absorb more than 3 per cent of its weight of water. W. Bierhalter (*Zement*, March 28, 1929).

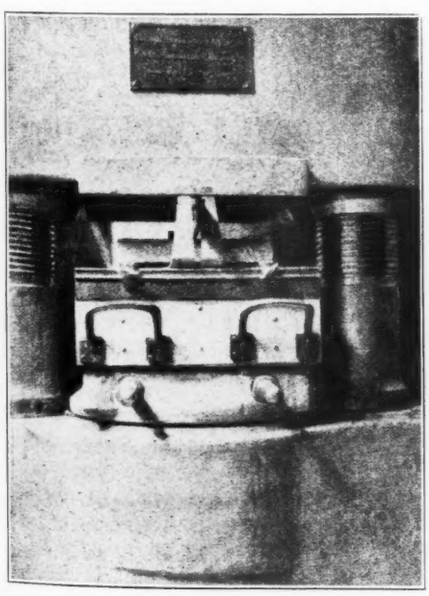


Fig. II. Flexile Strength Test Machine

Two New Cements

A mixture of baked clay with CaO, $Ca(OH)_2$, $CaCO_3$ or other Ca compound is treated with H_2SO_4 to give a product containing $CaSO_4$, $Al_2(SO_4)_3$ and colloidal SiO_2, and this product is mixed again with a Ca compound. It is preferred to use clay pretreated with NaOH solution and to operate at 100-316 degrees.

Clinker of normal portland cement containing or mixed with additional $CaCO_3$ sufficient to satisfy the SiO_2, Al_2O_3 and Fe is submitted to one or more bakings and ground after cooling. A retarder such as gypsum may be added before grinding. Swiss Patent 127,196 (French Patent 642,-168).

Cement

In the preparation of a substance containing Ca aluminate for cement, the primary material containing Al_2O_3 is treated with a reducing agent for the SiO_2 with addition of part only of the CaO-containing material. The rest of the CaO-containing material is afterwards added to the fused bath. To facilitate the reduction, Fe turnings or Fe ore is added.—J. A. Bonthron and T. R. Haglund (French Patent 643,024).

Cement and Corrosive Solutions

The active hydraulic substance in portland cement is the very labile compound beta-dicalcium silicate, which forms a solid solution with lime. Along with the dicalcium silicate there are various compounds of the system lime-alumina-silica, such as monocalcium aluminate, tricalcium aluminate, etc. During the setting and hardening process two reactions take place. 1. The setting processes set free the excess lime from the above compounds with the formation of calcium hydrate and calcium hydro silicates and aluminates. This process is complete in a few hours. 2. The calcium silicates and aluminates hydrate very slowly to form a solid gel with liberation of additional amounts of lime. It is evident that the presence of sulphate ions in the form of neutral salts will result in the formation of calcium sulphate and the hydroxide of the metallic salt used. For example:

Fig. III. Calcium Sulphate Crystals × 60

$$\underset{\text{Hydrated Lime}}{Ca(OH)_2} + \underset{\text{Sodium sulphate}}{Na_2SO_4} \quad \underset{\text{Calcium sulphate}}{CaSO_4} + \underset{\text{Sodium hydroxide}}{2NaOH}$$

The formation of calcium sulphate was proven with all the salts used by photographs. Figure III shows a bundle of such crystals obtained with sodium sulphate. Figure IV shows a few of the same crystals photographed under greater magnification. It is the formation of this substance that effects the disintegration of cement mortars and concretes in corrosive waters. The resistance to such corrosion was found to vary from that of ordinary Portland cement, which was weakest to aluminous cement which resisted best. High test Portland was intermediate between these two.—E. Probst and K. E. Dorsch (*Zement*, March 14, 1929).

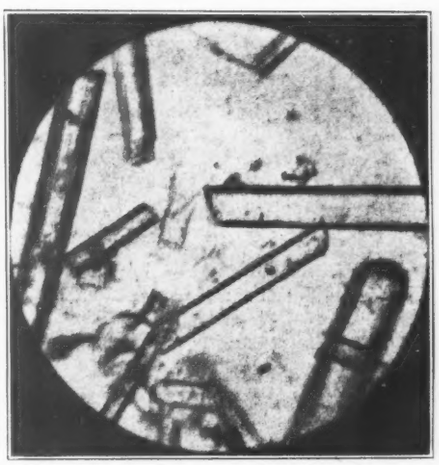


Fig. IV. Calcium Sulphate Crystals × 200

Rotary Kiln for Cement

The preheating zones of rotary cement kilns are customarily enlarged by the removal of the fireproof lining from that portion of the kiln. The objections to this procedure are obvious On the one hand, the enlargement is so slight as to be ineffective; on the other, the omission of the protective lining is not permissible. The diagram, Figure I, shows a cross-section of a rotary kiln with enlarged preheating zone of recent German design. *A* is the rotary kiln, *b*, the lining of the enlarged charging zone.—G. Polysius (German Patent pplication 51,669).

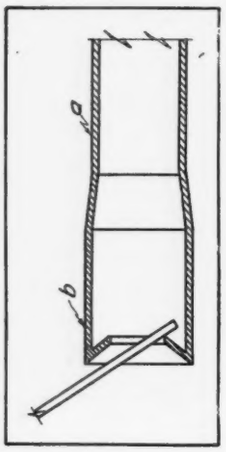


Figure I.—Cross Section of a Rotary Kiln

Gypsum and Cement

The use of gypsum to retard the setting of cement is well known. Anhydrite which is also a calcium sulphate, but differs from gypsum in containing no water, whereas gypsum contains two molecules, has also been found to be of great interest for this purpose. The advantage of anhydrite over gypsum is that additions of the former have less great effect than those of the latter and the setting can be more easily regulated. The following table shows the effect of gypsum and anhydrite additions, both in the laboratory and the field:

Pure clinker without additions..		Laboratory Beginning 1 minute	Laboratory End 15 minutes	Field Beginning 1 minute	Field End 15 minutes
+Gypsum	1 %	2 hours	6 hours	3 hours	6½ hours
	1½ %	3½ hours	7 hours	4 hours	7½ hours
	2 %	4½ hours	8 hours	4½ hours	8½ hours
+Anhydrite	1 %	1 minute	15 minutes	1 minute	5 minutes
	2 %	2 minutes	20 minutes	1 minute	5 minutes
	3 %	4 minutes	25 minutes	1 minute	6 minutes
	4 %	3¼ hours	9¼ hours	15 minutes	35 minutes
	5 %	3½ hours	9 hours	45 minutes	3 hours

Dr. F. Killig (*Zement*, February 28, 1929).

Lime Kilns

Is the rotary or shaft kiln preferable for lime burning? The rotary kiln may be charged with very small pieces of limestone such as chalk or with calcareous rock which disintegrates during the burning. On the other hand, the shaft kiln, if reasonably convenient discharging is to be attained, must be charged with stone pieces between 2 and 10 inches in size. Yet the burning in rotary kilns is better regulated and conducted in such fashion as to produce a lime of better quality. Powdered lime, however, is very susceptible to air slaking and granular and "pebble lime" are justly considered first quality for building construction. The ratio of fuel to lime is 1:2.5 for shaft kilns and 1:4 for rotary, showing a great advantage for the rotary type. But these ratios do not take into account the hot exhaust gases which are used in heat recovery systems. The production of the rotary kiln is much greater than the shaft type, being 50 tons per day with the former and only 15-20 with the vertical. If the powdered lime produced is acceptable to the market to which it is offered, the rotary kiln presents the following advantages: (1) For use with soft limestones or with fines. (2) For large capacity. (3) For continuous production. (4) For localities where the labor cost is excessive. (5) For sections where fuel is cheap and easily pulverized, and (6) where it is possible to utilize the heat in the waste gases by suitable apparatus.—Rassegna (*Mineraria e Metallurgica* Vol. 68, No. 1. Le Ciment Feb. 1929).

Fused Cements With a High Alumina Content

A comprehensive series of experiments was carried out on binary and ternary systems of chemically pure SiO_2, Al_2O_3 and lime. The fused materials cooled quickly, by quenching or gradually, then ground to a uniform fineness and tested for strength, soundness and resistance to chemical attack. Contrary to experience with granulated slag, these products, if plunged in water while still fluid, give less favorable results than those cooled normally. Their setting time is shorter and their strength inferior. In general, the products fall into three classes: (1) those incapable of setting, (2) quick-setting cements of low strength, in some cases expanding or disintegrating in water after hardening, (3) slow-setting, high-strength products resistant to those salt solutions, which are highly injurious to ordinary cements. A ternary diagram is given showing the zones occupied by the three classes mentioned, and details are presented in the form of a table. The diagram shows that the replacement of lime by silica, in a compound of fixed alumina content, results in a rapid decrease in strength. The proportion of alumina should lie between 45 and 70 per cent; of lime, between 47 and 28 per cent; and of silica, between 12 and 0 per cent. These values hold only for chemically pure substances, the impurities present in commercial raw materials causing considerable modification.—R. Feret. Building Sci. Abstracts *1*, 207. C. A.

The "Best" Portland Cement

Both practical and theoretical considerations lead to the conclusion by an outstanding German cement authority that the cement having most desirable properties would be one with a low iron oxide content but with alumina present in somewhat greater than usual amounts. The composition of the "ideal" clinker is represented by:

$$\frac{X}{31}+\frac{Y}{35}+\frac{Z}{59}=0.95$$

where x, y and z are, respectively, the per cent. by weight of Al_2O_3, SiO_2, and Fe_2O_3, if these constituents together with the lime add up to 100 per cent, that is, that no other substances are present. The per cent lime would be, therefore, W=95—X—Y—Z. If we assume Z (Fe_2O_3) to be 2 per cent, and X (Al_2O_3)=8 per cent, then SiO_2 will equal 21.3 per cent, and the lime 63.7 per cent. If these assumptions are correct, the clinker with 63.7 per cent lime, 21.3 per cent silica, 8 per cent alumina, 2 per cent iron oxide and 5 per cent other substances, would be the "best" which could be made. If the alumina content be raised to 10 per cent, the iron retained the same, the silica

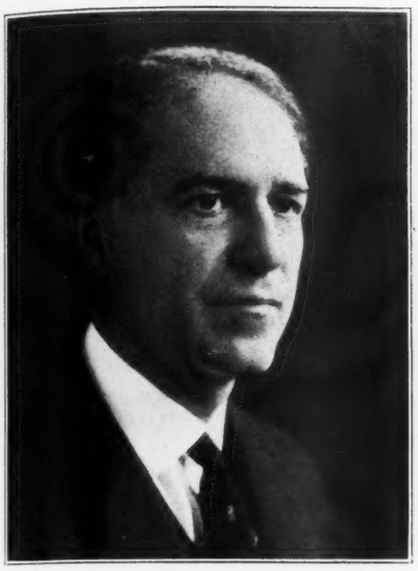
Porous Cement

A porous cement is made from mineral substances capable of setting and Ca alloys which are capable of liberating gases in the presence of water and in which the Ca is in excess. Ca-Zn, Ca-Mg or Ca-Mg-Zn are suitable.—Julius Meyer and Emil Asmus (German Patent 469,864).

Slag Cement

Granulated moist slag from blast furnaces and quick or slacked lime are carried by separate elevators to a mixer from which the mixture is led to a rotating furnace and from thence to a grinder. French Patent 641,753. Oct. 3, 1927.

INTIMATE NEWS OF MEN AND PLANTS



Colonel James W. Fuller

Prominent Executive in Several Industries Passes Away

James W. Fuller, president of the Fuller Company of Catasauqua, Pennsylvania, president of the Allentown Portland Cement Company, director and executive in numerous other large corporations and prominently identified with industrial affairs in Pennsylvania for many years, was born April 2, 1873 at Catasauqua, Pennsylvania. He was a son of James W. Fuller, who was a successful man of affairs, president of the McKee Fuller Company, which was subsequently The Lehigh Car Wheel and Axle Company, and of the Fuller-Lehigh Company of which he was the founder and executive head up to the time of his death.

James W. Fuller, the subject of this sketch, was educated at the Haverford Preparatory School, at Haverford, Pennsylvania. Upon the death of his father he was elected president of the Fuller-Lehigh Company which position he ably filled until January 4, 1926, when the company was sold to the Babcock and Wilcox Company and he remained with them as chairman of the Board until April 1, 1926 when he retired and organized the Fuller Company of which he was president with executive headquarters at Catasauqua, Pennsylvania.

He was a member of the Society of Mechanical Engineers, the B. P. O. E., the Catasauqua Club, Northampton Country Club, Lehigh Country Club, Saucon Valley Country Club, Livington Club of Allentown, Pennsylvania, Engineers Club of New York, Westchester Biltmore Country Club of Rye, New York and the Congressional Club of Washington, District of Columbia. He was married March, 1917 to Miss Dorothy S. Stalcup of Denver, Colorado.

Colonel Fuller had been on a vacation to the Pacific Coast and the Hawaiian Islands and on his return passage from the Islands, was taken seriously ill and moved from the boat to the St. Luke's Hospital in San Francisco on March 20, where he passed away on April 4. Mrs. Fuller, who had been with the Colonel on his trip, was with him at the time of his death, as was also his oldest son, James W. 4th.

Office Removals

The Pennsylvania-Dixie Cement Corporation announces the removal of its New York offices to 521 Fifth Avenue.

The Copley Cement Manufacturing Company and the Saylor's Portland Cement Company announce the removal of their offices to the same building, the Lefcourt National Building.

Michigan Conservation Commission Stops Beach Dredging

Acting upon protests made by Berrien county organizations and property owners, the state conservation commission has ordered the Great Lakes Sand and Gravel Company to cease removing sand from the lake shore along the Berrien coast.

The conservation commission's order concludes a bitter controversy between Berrien residents and the sand company, waged over a period of more than two years. The plaintiffs charged that the company is removing 200,000 cubic yards of sand a year with its dredges, and is ruining the coast bathing beaches. The sand company argued that shore changes were due to natural erosion and higher lake levels.

Schundler Rebuilding Plant

F. E. Schundler and Company, grinders and shippers of many nonmetallics such as limestone, marble, slate, feldspar, talc, soapstone, fuller's earth, magnesite, bentonite and kieselguhr, is rebuilding its plant at Joliet, Illinois, which was demolished last December and expect to be in production again by June 1.

William Gillies Ross

Canada Loses By Death a Leader in Asbestos Industry

In the recent death of William Gillies Ross, Canada was deprived of one of her most worthy men in public and industrial lines. He was connected with various street railway and public utility companies. In 1910 he was made vice-president of the American Street Railway Association.

When the asbestos industry in Quebec reached its lowest ebb, in 1911-1912, Mr. Ross took the reins and the industry soon rose until it was flourishing. Finally many competing firms were amalgamated, with Mr. Ross as president and managing editor of the Asbestos Corporation of Canada, a position that he retained until his death, April 15, 1929, at the age of 65 years.

At the request of the Navy League, London, England, he organized the Navy League of Canada, and was its first Dominion President. He was decorated by the Navy League, London, with the Special Service Decoration in 1917 and elected a member of the executive committee of that league in 1918. He raised $2,000,000 for sailors' relief work when president of the Navy League of Canada.

Canada Cement Acquires Property in St. John

The Canada Cement Company has purchased a property fronting on the harbor at St. John, New Brunswick, Canada, and the construction of a new cement plant may begin this summer.

NEWS OF EQUIPMENT MANUFACTURERS

Williams Double Arch Dragline Bucket

Williams Dragline Bucket Is Skid-Proof

The Double-Arch dragline bucket manufactured by the G. H. Williams Company possesses an interesting non-skid characteristic. As soon as the drag cable is taut, this bucket at once starts to dig in—bites right into any material that is diggable. Skidding (or sliding over the surface without getting hold of the material) has been entirely overcome by a digging line that has been scientifically computed, and by the careful distribution of the bucket's weight. The results of this feature are remarkable under any digging conditions, but particularly so when the bucket is working in a shallow stripping cut, in which it is ordinarily difficult for a bucket to get a full load. Working under these conditions, this bucket fills itself in twice its length.

A three-way adjustment of the drag chain makes it easy to get the full advantage of this bucket's correct digging line and distribution of weight on any kind of work to be done. It can be set at the best angle for a shallow stripping cut, for deep digging to load material, or to slope a drainage ditch.

American Hoist and Derrick Company Announces Canadian Agency

The American Hoist and Derrick Company announces the appointment of A. R. Gelinas as sales agent for its machinery in Ontario, Quebec and the maritime providences of Canada. His office is in the McRitchie and Black Building, Montreal, Canada.

These Power-Operated Capstans Minimize Labor

For moving freight cars and barges in construction and industrial plants, the Lidgerwood Manufacturing Company is marketing a new vertical capstan known as the Tugmore. Compactness has been emphasized in the design, reducing the space requirements to 25 in. by 34 in. It is claimed that, with the installation of a Tugmore capstan, continuous loading or unloading may be maintained without the necessity of assigning a crew of men to shift cars by hand methods.

The Tugmore is of a standard type and is available in five sizes: 5-hp. and 7½-hp., either alternating current or direct current, and a 6-hp. to 8-hp. twin-cylinder, air-cooled motor using gasoline or kerosene for fuel.

Louis E. Murphy Elected President, E. F. Houghton And Company

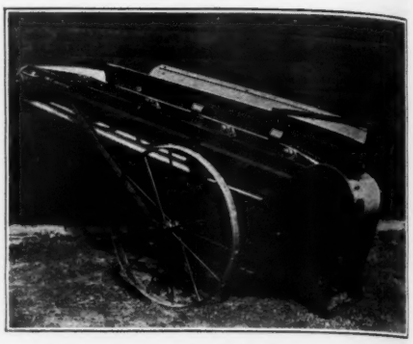
At a special meeting of the Board of Directors of E. F. Houghton and Company of Philadelphia, held April 29, Louis E. Murphy was elected president to succeed the late president, Charles E. Carpenter, who died April 6, 1929. A. E. Carpenter was elected first vice-president and treasurer, and George W. Pressell was elected second vice-president and secretary. Besides these officers the directors are as follows: R. H. Patch, Mrs. N. Greenlee, Miss M. M. Menningen, C. Howard Butler, S. H. Willison and Robert E. Lamberton.

Engine Radiator That Does Not Clog With Cement

The Young Radiator Company manufactures a radiator for gasoline engines of concrete mixing machines. Special design of the air passages eliminates clogging by wet or dry cement. Instead of irregular-shaped fins, these fins are straight and are widely spaced. They are made in sizes to cool motors ranging from 3 h.p. to 150 h.p. or more.

New Type of Box-Car Loader Is Announced

The Ottumwa Box-Car Loader announces a new car loader known as Type A. This is mounted on large wheels which assure its easy placement, inside or outside of a car, by one man. Its angle of slope is adjustable. The belt travels in a trough on the conveying side. Either or both ends may be quickly raised or lowered. It is completely equipped for Alemite greasing. The conveyor is driven by a 3-hp. electric motor.



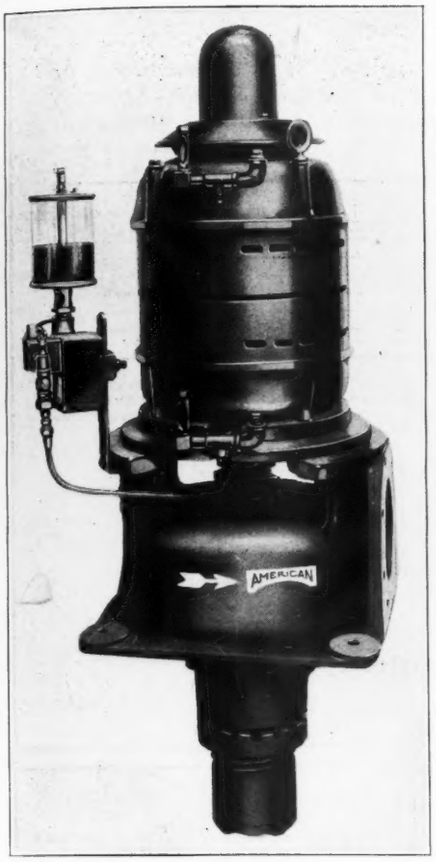
Ottumwa Type A Box-Car Loader

Skidding is Minimized With New Type of Differential

The Krohn Differential Corporation is marketing a type of differential gear, for all kinds of automobiles, which eliminates the spinning-wheel characteristic of the conventional design. It is not a locking type and is simple in construction. It permits one wheel to turn if jacked up but it will not allow one wheel to spin idly, thereby robbing the other wheel of power as on slippery pavements or in mud.

The three simple working parts of the Krohn differential are shown in the central part of the illustration. The two halves of the case are at the right and left. A ring gear is mounted on the case, just as with any differential, and the rotation of the case is imparted to the central gear. This, in turn, transmits rotation to the other two gears which are splined on the two drive shafts. The differential action is obtained, when traction varies, by a difference in the number of teeth in the various gears, which permits the central gear to rotate about the other gears. This allows slight rotation of one driving wheel with respect to the other which is necessary when rounding corners.

Krohn Differential



American Deep-Well Turbine

Compact Turbines Designed For Deep-Well Pumping

The American Well Works announces new 6-in. and 8-in. deep-well turbines. These turbines have been built to fit smaller bored wells. The turbine consists of the turbine head proper, which is the driving unit; the supporting pipe, which encloses the driving shaft; and the turbine itself, which consists of the number of stages necessary for the specific requirements.

The turbine proper is a special style of the centrifugal type with special features. All bearings are oil lubricated by gravity feed from the surface.

New Relay Actuates Warning in Alarm Circuits

The General Electric Company announces a new relay, CR-2810-1245, for use on various types of alarm circuits. This device is of the normally-closed type and functions to actuate a warning signal on the failure of power. The new relay is strongly built, of simple construction and operates very quietly. The contact construction is of the silver-to-silver type, and is double-break. It is made in standard ratings.

Applications of the relay are expected to be many and various, ranging from simple failure of power where no more serious consequences result, to more involved circumstances where power failure would result in serious consequences, such as the failure of heat in an incubator. The warning signal controlled by the relay may be a bell, a horn, a whistle, a light, or any other common device, and would probably be energized by batteries.

A Cast Grid Resistor

An excellent cast grid resistor for controlling the current of slip-ring motors, direct current crane motors and direct current adjustable speed motors, is being manufactured by the Columbia Electric Manufacturing Company, a subsidiary of The Fuerst-Friedman Electric Company, of Cleveland. The cast grid resistor reduces heating to a minimum, eliminates all high-resistance joints, breakage, and loose connections at point of contact.

Conkey Company Appoints Sales Engineer

H. C. Dixon, recently resident engineer for the Illinois Division of Highways, Ottawa office, has become sales engineer for the sand and gravel department of H. D. Conkey and Company, Mendota, Illinois.

Galion Iron Works Selects Western Distributors

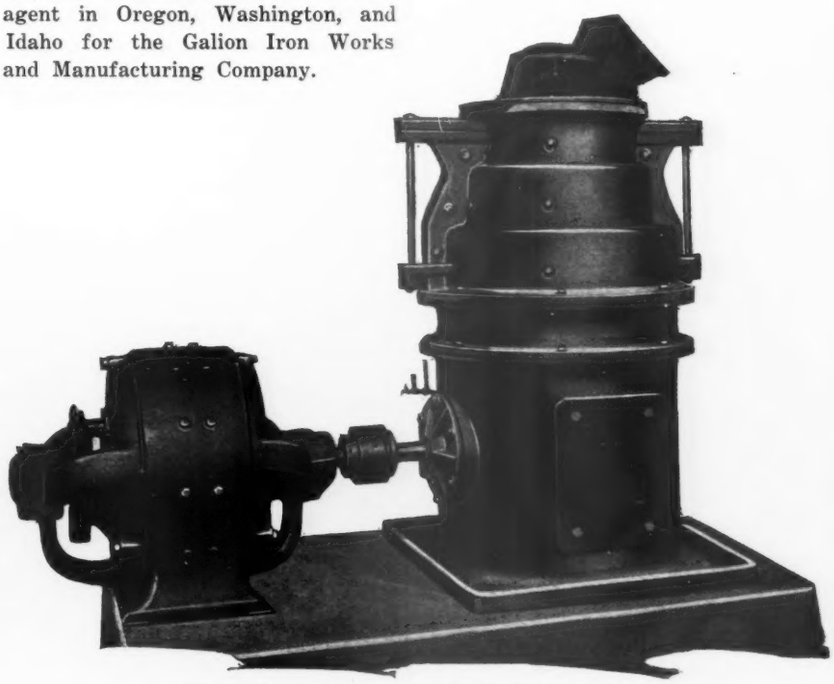
The Feenaughty Machinery Company has been appointed distributing agent in Oregon, Washington, and Idaho for the Galion Iron Works and Manufacturing Company.

Complete stock and service facilities will be maintained at its branches in Seattle and Spokane, Washington, and Boise, Idaho, as well as in Portland.

Uniform Pulverization Attained by New Type of Machine

The Whirlwind pulverizer is a radically new piece of equipment designed for the reduction of any kind of stone or mineral to a fine uniform powder. It comprises a vertical step-shaped casing, vertically split, containing three chambers, each lined with corrugated chrome-nickel alloy plates. Mounted upon a central vertical shaft are three horizontal steel discs, each revolving in its own pulverizing chamber. The top disc is smallest, the second larger, and the bottom one the largest. Chrome-nickel hammers are bolted upon each disc. Beneath the third stage is the discharge chamber from which the finished material is swept by a two-bladed paddle mounted upon the vertical shaft.

Raw material, in sizes of 1-inch and less, enters at the top through a gate that is adjustable to prevent the entry of excess air. This is an air-swept mill, the pulverized product being floated, and a remarkable uniformity in fineness is maintained. The mills are available in three sizes with hourly capacities rated at from 500 lb. to 7,000 lb. The Whirlwind is manufactured by the George F. Pettinos Company.



The Whirlwind Pulverizer with Electric Drive

Rates for display advertisements in the Broadcast Section are given below. If you want to buy or sell used equipment, if you want a job or need a man, advertise your wants in Pit and Quarry. Advertisement copy for publication in the next issue should reach our office within one week after the date of this issue.

RATES PER INSERTION	1 Inch	2 Inches	3 Inches	4 Inches	5 Inches	6 Inches	8 Inches	9 Inches	10 Inches	12 Inches	15 Inches	20 Inches	30 Inches
1 Insertion	$ 3.75	$ 7.25	$10.75	$14.25	$17.75	$ 21.25	$28.25	$31.75	$35.25	$42.25	$56.25	$70.25	$105.00
2 Insertions	3.75	7.25	10.70	14.20	17.65	21.15	28.15	31.65	35.15	42.15	56.15	70.00	104.00
3 Insertions	3.75	7.20	10.65	14.15	17.55	21.05	28.05	31.55	35.10	42.05	56.05	69.75	103.00
4 Insertions	3.70	7.15	10.60	14.10	17.45	20.95	27.95	31.45	35.00	41.95	55.90	68.75	101.00
8 Insertions	3.65	7.05	10.50	14.00	17.25	20.75	27.75	31.25	34.80	41.75	55.70	67.50	98.00
13 Insertions	3.60	6.95	10.40	13.90	17.05	20.55	27.55	31.05	34.60	41.55	55.55	66.25	94.00
26 Insertions	3.50	6.75	10.20	13.70	13.65	20.05	27.05	30.65	34.20	41.05	55.05	64.00	88.00

INFORMATION—"Broadcast" space is sold by the advertising "inch." Each page contains 30 inches. The width of the page is divided into 3 columns, each 2¼ inches wide. Each column contains 10 inches measured the length of the column. Any space may be used measured by the *even* inch in height (not fractions), by 1, 2 or 3 columns in width The size of a space is its height in inches multiplied by the number of columns in width. Example: a space 3 inches high by 2 columns wide is 6 inches. Copy changes made without additional charge.

It Pays to Advertise in PIT AND QUARRY

"We hereby extend our compliments and thanks for the excellent service given regarding our advertisement in a recent issue of your journal, known as PIT AND QUARRY.
We received very satisfactory results from same, and obtained sufficient interested and bona fide prospects with which to carry on our negotiations for the sale of the sand and gravel plant which was advertised in your journal." —National Business Brokers Corp.

Complete Service Publishing Company
538 South Clark Street CHICAGO

Machinery for Sale

SPECIALS
1—3-Roll Bradley Mill.
1—No. 6 Williams Universal Hammer Mill

CRUSHERS

Crushing Rolls

2—8"x5", 2—24"x12", 1—24"x14", 1—30"x12", 1—30"x16", 2—36"x16", 2—42"x16", 1—54"x24".

Gyratory

All sizes from No. 2 Reduction to No. 12K.

Jaw

1—2"x6", 1—6"x3", 2—8"x10", 1—6"x15", 2—9"x15", 1—11"x22", 2—12"x24", 1—18"x36", 1—24"x36", 1—60"x84".

Rotary

Two No. 0, two No. 1, one No. 1½, and one No. 2 Sturtevant Rotary Fine Crushers.

Ring Roll

One No. 1 and one No. 2 Duplex Sturtevant ring roll mills.

Ball and Tube Mills

3', 4', 4½', 5', 5½', 6', 8' Hardinge Mills and Tube Mills.

DRYERS

One 3'x30', Three 4'x30', One 4½'x30', One 5'x40', One 5½'x40', One 6'x60', One 7'x60' and One 8'x80' Direct Heat Rotary Dryers, One 5'x25', One 6'x30', Two 8'x80' Ruggles Coles type "A" and One 5'x30' indirect heat rotary dryer.

KILNS

3'x15', 4½'x36', 6'x60', 6'x70', 6'x100', 6'x120'; 1—4½' Bruckner Roasting Furnace.

MILLS

Two 33" and two 42" Fuller Lehigh Mills.
1 No. 0000, 1 No. 00, 2 No. 1, 2—4 Roll, and 1—5 Roll Raymond.
Swing Hammer Mills, Griffin Mills, Attrition and Cage Mills.
Air separators, Screens, Elevators and Conveyors, Sand Washers and Classifiers.

The Heineken Engineering Corp.
Industrial Engineers
117 Liberty St., New York City
Courtlandt 5130

SHOVELS

1—LORAIN 75, Gasoline Crawler, New 1928, All-Steel Center Drive Crawlers, 1¼-yd., HIGH LIFT; Like new.

1—P. & H. Model No. 600 Gasoline Crawler, New late 1927, 1 yd., High Lift; Excellent condition.

1—ERIE B-2 DREADNAUGHT, Steam Crawler, New 1927, 1-yd., High Lift; completely re-built, good as new.

1—MARION 37, Steam Crawler; New 1925, 1¾ yd., Boom 26 ft. Rebuilt, Excellent condition.

CRANES

1—15-ton cap. LINK-BELT, Gasoline Crawler, New 1928; 50-ft. Boom; Bucket operating; Perfect condition.

1—12-ton cap. NORTHWEST No. 105, Gasoline Crawler, New 1926; 45-ft. Boom; Bucket operating; Excellent condition.

Grey Steel Products Co.
111 Broadway :-: New York, N. Y.

DERRICKS
2—25 ton Steel Guy 110' Masts.
1—15 ton Timber. 70' steel boom.
2—5 ton 50 and 60' boom steel stiffleg.
1—10 ton Lambert Steel Guy Derrick 112' mast, 100 ft. Boom, 18' Bullwheel, bucket operating.
1—10 ton Insley, 110' mast, 100' boom, 12' bullwheel bucket operating

HOISTING ENGINES
2—75 HP National Triple Drum Independent Motor Driven Swingers and Bank Lever Controls, 3 phase, 60 cycle, 440 volts.
1—60 HP National 3-Drum Elec. with Swinger
1—30 HP Lidgerwood DD Elec.
1—22 HP Lambert Electric D. D.
1—40 HP Novo 4-cylinder Gasoline D. D.
1—8x12 Mundy Triple Drum Skeleton
1—7x10 Stroudsburg, Triple Drum, Boiler Mounted.

GANTRY CRANES
2—Link-Belt Tower mounted, 90' boom, steam operated full revolving Gantry cranes, mounted on 30' towers

GASOLINE SHOVELS AND CRANES
1—1 cu. yd. Link Belt Combination, 50-ft. boom.
1—Model 105 Northwest Crane 40' boom.
1—¾-yd. Complete Shovel Front (boom, dipper, and dipperstick) for Model 206 P. & H.

STEAM SHOVELS
1—Marion 37 Cat. 1¾ yd. dipper
1—Marion 32 Cat. 1¼ yd. dipper

GASOLINE LOCOMOTIVES
1—8 ton Plymouth 36" ga.

AIR COMPRESSORS
2—100 cu. ft. Chicago Pneumatic Portable Gasoline.
2—240 cu. ft. Penna. Motor Driven 40 HP 3 ph. 60 cy. 220/440 vs.
1—309 cu. ft. Ingersoll Rand Portable, Gasoline.

B. M. WEISS
1234 Widener Bldg., Philadelphia, Pa.

CRUSHERS
Traylor Jaw 36x42" Manf. fitted
Gates Gyratory, 15-N 30" opening.
Gates Gyratory, 12-K.
McCully Gyratory No. 8, 5, 4, and 3.
Allis Chalmers, Edison Roll Crusher 72 in. x 84 in.
Telsmith No. 4 and No. 2-F Reduction.
Kennedy gearless No. 37 Reduction.
Austin No. 10, No. 6 and No. 5 gyratory.
Good Roads 10x20 portable.
Jaw Crushers, 7x15, 9x15, 12x24, 18x24, and 10x16.
Allis Chalmers Gates 7½-K and 6.
Symons Disc 48", 36", 24" and 18".
Sturtevant No. 1½ Rotary Fine Crusher.
Jeffrey Hammer Mill type A, 36x24".
Stephens-Adamson all Steel Bucket Elevator.
Stephens-Adamson Pan Conveyor.
Screens 48x20', 48x16', 40x12'.
Crushing Rolls various Sizes.
OTHER CRUSHERS, SCREENS AND CONVEYORS.
CRANES, SHOVELS AND DRAGS
Bucyrus 35-B Shovel Cat. 1¾ yd.
Orton Comb. Shovel and Crane, ½ yd. Gas. Cat.
Northwest 105, Comb. Shovel and Crane, ¾ yd.
Insley Gas. Cat. Shovel ½ yd.
Marion 31 Cat. 1¼ yd. low price.
Bucyrus Cl. 14 Cat. Dragline 80' boom, 2 yd.
Bucyrus Cl. 24 Dragline electric 100' Boom.
Speeder ½ yd. Gas. Cat. Shovel.
Byers Bearcat Crane 28' Boom, low price.
Bucyrus 30-B Diesel Combination, 1 yd.
Insley Gas. Cat. Crane 30' Boom.
Bucyrus Shovel 80-B Cat. 2yd.
Other makes and sizes on hand.
COMPRESSORS, CARS, LOCOMOTIVES, BOILERS BUCKETS AND POWER EQUIPMENT

F. MAYER
53 W. Jackson Blvd., Chicago, Ill.

LOCOMOTIVE CRANES

FOR SALE OR RENT

1—15-ton cap. BROWNHOIST, 8-wheel MCB, double drums, 48-ft. 3½-in. boom, ASME boiler just retubed. ¾-yd. Williams Clamshell Bucket.
1—No. 8 BROWNING heavy 20-ton cap., 8-wheel MCB, double drums, 50-ft. boom, ASME boiler, separate swinger. Just overhauled.
1—No. 4 BROWNHOIST 15-20-ton cap., 8-wheel MCB, double drums, 48-ft. 3½-in. boom, brand new ASME boiler. Thoroughly overhauled.

PHILIP T.
KING
"The Crane Man"
50 Church St. New York

Speeder Shovel

Reconditioned.
New paint — Will demonstrate.
Worth the price.
R. E. BROOKS CO.
50 Church St. New York City